

SEQUENCE LISTING

<110> Rudert, Fritz
Ge, Liming
Ilag, Vic

<120> Novel method and phage for the identification of
nucleic acid sequences encoding members of a multimeric
(poly)peptide complex

<130> MORPHO/9

<140>

<141>

<150> PCT/EP98/04836

<151> 1998-08-03

<150> EP 97 11 3319.4

<151> 1997-08-01

<160> 50

<170> PatentIn Ver. 2.1 + PatentIn Ver. 2.0 + WordPad

<210> 1

<211> 19

<212> DNA

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: primer CAT_BspEI(for)

<400> 1

gaatgctcat ccggagtgc

19

<210> 2

<211> 35

<212> DNA

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: primer CAT_Bsu36I(rev)

<400> 2

tttactggc ctcaggctag caccaggcgt ttaag

35

<210> 3

<211> 7783

<212> DNA

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: phage vector fhag1A
(circular)

<220>

<221> CDS

<222> (1)..(828)

<223> C-terminus gene II

<220>
 <221> CDS
 <222> (496)..(828)
 <223> gene X

<220>
 <221> CDS
 <222> (843)..(1103)
 <223> gene V

<220>
 <221> CDS
 <222> (1108)..(1206)
 <223> gene VII

<220>
 <221> CDS
 <222> (1206)..(1313)
 <223> gene IX

<220>
 <221> CDS
 <222> (1301)..(1519)
 <223> gene VIII

<220>
 <221> CDS
 <222> (1643)..(2299)
 <223> cat resistance gene

<220>
 <221> CDS
 <222> (2769)..(4136)
 <223> ompA-FLAG-scFv(anti-HAG)-gene IIIss

<220>
 <221> misc_feature
 <222> (2769)..(2831)
 <223> ompA signal sequence

<220>
 <221> misc_feature
 <222> (2832)..(2843)
 <223> FLAG peptide

<220>
 <221> misc_feature
 <222> (2844)..(3641)
 <223> scFv (anti-HAG)

<220>
 <221> misc_feature
 <222> (3666)..(4139)
 <223> gene IIIss

<220>
 <221> CDS
 <222> (4231)..(4566)
 <223> gene VI

<220>
 <221> CDS
 <222> (4572)..(5615)

<223> gene I

<220>

<221> CDS

<222> (5596)..(6873)

<223> gene IV

<220>

<221> CDS

<222> (7382)..(7783)

<223> N-terminus gene II

<220>

<221> -10 signal

<222> (2679)..(2683)

<220>

<221> -35 signal

<222> (2656)..(2660)

<220>

<221> misc_feature

<222> (2684)..(2718)

<223> lac operator

<220>

<221> rep_origin

<222> (6992)..(7137)

<223> fd ori

<220>

<221> misc_signal

<222> (6874)..(6952)

<223> packaging signal

<220>

<221> terminator

<222> (4178)..(4220)

<223> fd terminator

<400> 3

```

aacgctacta ccattagtag aattgatgcc acctttttcag ctgcgcgccc aaatgaaaat 60
atagctaaac aggttattga ccatttgcga aatgtatcta atgggtcaaac taaatctact 120
cgttcgcaga attgggaatc aactgttaca tggaatgaaa cttccagaca ccgtacttta 180
gttgcatatt taaaacatgt tgaactacag caccagattc agcaattaag ctctaagcca 240
tccgcaaaaa tgacctctta tcaaaaggag caattaaagg tactgtctaa tcctgacctg 300
ttggaatttg cttccgggtc ggttcgcgtt gaggctcgaa ttgaaacgcg atatttgaag 360
tctttcgggc ttcctcttaa tctttttgat gcaattcgct ttgcttctga ctataataga 420
cagggtaaag acctgatttt tgatttatgg tcattctcgt tttctgaact gtttaaagca 480
tttgaggggg attcaatgaa tatttatgac gattccgcag tattggacgc tatccagtct 540
aaacatttta caattacccc ctctggcaaa acttcctttg caaaagcctc tcgctatttt 600
ggtttctatc gtcgtctggt taatgagggg tatgatagtg ttgctcttac catgcctcgt 660
aatcctttt ggcggttatgt atctgcatta gttgagtggt gtattcctaa atctcaattg 720
atgaatcttt ccacctgtaa taatgttggt ccgttaggtc gttttattaa cgtagatttt 780
tcctcccaac gtccctgactg gtataatgag ccagttctta aaatcgcata aggtaattca 840
aaatgattaa agttgaaatt aaaccgtctc aagcgcaatt tactaccctg tctgggtggt 900
ctcgtcaggg caagccttat tcaactgaatg agcagctttg ttacgttgat ttgggtaattg 960
aatatccggt gcttgtcaag attactctcg acgaagggtc gccagcggtat gcgcctgggtc 1020
tgtacaccgt gcatctgtcc tcgttcaaag ttgggtcagtt cggttctctt atgattgacc 1080
gtctgcgcct cgttccggct aagtaacatg gagcaggtcg cggatttcga cacaatttat 1140
caggcgatga taaaaatctc cgttgtactt tgtttcgcgc ttggtataat cgctgggggt 1200
caaagatgag tgtttttagtg tattctttcg cctctttcgt tttagggttg tgccttcgta 1260
gtggcattac gtattttacc cgtttaattg aaacttcctc atgcgtaagt ctttagtcct 1320

```

caaagcctcc	gtagccgttg	ctaccctcgt	tccgatgctg	tctttcgctg	ctgaggggtga	1380
cgatcccgc	aaagcggcct	ttgactccct	gcaagcctca	gcgaccgaat	atatcggtta	1440
tgcgtgggcg	atggttggtg	tcattgtcgg	cgcaactatc	ggtatcaagc	tgtttaagaa	1500
attcacctcg	aaagcaagct	gataaaggag	gtttctcgat	cgagacgtn	nnngagggtc	1560
caactttcac	cataatgaaa	taagatcact	accggggcgta	ttttttgagt	tatcgagatt	1620
ttcaggagct	aaggaagcta	aaatggagaa	aaaaatcact	ggatatacca	ccgttgatat	1680
atcccaatgg	catcgtaaag	aacattttga	ggcattttcag	tcagttgctc	aatgtacct	1740
taaccagacc	gttcagctgg	atattacggc	cttttttaaag	accgtaaaga	aaaataagca	1800
caagttttat	ccggccttta	ttcacattct	tgcccgcctg	atgaatgctc	atccggagtt	1860
ccgtatggca	atgaaagacg	gtgagctggt	gatatgggat	agtgttcacc	cttgttacac	1920
cgttttccat	gagcaaaactg	aaacgttttc	atcgctctgg	agtgaatacc	acgacgattt	1980
ccggcagttt	ctacacatat	attcgcaaga	tgtggcgtgt	tacggtgaaa	acctggccta	2040
tttccctaaa	gggtttattg	agaatatggt	tttcgtctca	gccaatccct	gggtgagttt	2100
caccagtttt	gatttaaacg	tggccaatat	ggacaacttc	ttcgccccc	ttttcaccat	2160
gggcaaatat	tatacgcaag	gcgacaaggt	gctgatgccg	ctggcgatcc	agggttcac	2220
tgccgtctgt	gatggcttcc	atgtcggcag	aatgcttaat	gaattacaac	agtactgcga	2280
tgagtggcag	ggcggggcgt	aattttttta	aggcagttat	tgggtgccctt	aaacgcctgg	2340
tgctacgcct	gaataagtga	taataagcgg	atgaatggca	gaaattcgaa	agcaaattcg	2400
acccggtcgt	cgggttcaggg	cagggtcgtt	aaatagccgc	ttatgtctat	tgctgggtta	2460
ccggtttatt	gactaccgga	agcagtggtg	ccgtgtgctt	ctcaaatgcc	tgaggccagt	2520
ttgctcaggg	tctccccgtg	gaggtaataa	ttgctcgacc	gataaaaagc	gcttcctgac	2580
aggaggccgt	tttggttttgc	agcccacctc	aacgcaatta	atgtgagtta	gctcactcat	2640
taggcacccc	aggctttaca	ctttatgctt	ccggctcgta	tggtgtgtgg	aattgtgagc	2700
ggataacaat	ttcacacagg	aaacagctat	gaccatgatt	acgaatttct	agataacgag	2760
ggcaaatcat	gaaaaagaca	gctatcgcg	ttgcagtggc	actggctggt	ttcgctaccg	2820
tagcgcaggg	cgactacaaa	gatatcggtt	tgaccagtc	accgtcctcc	ctgaccgtta	2880
ccgctgggtga	aaaagttacc	atgtcctgca	cctcctccca	gtccctgttc	aactccggta	2940
aacagaaaaa	ctacctgacc	tggtatcagc	agaaaccggg	tcagccaccg	aaagttctga	3000
tctactgggc	ttccacccgt	gaatccgggt	ttccagaccg	tttcacccgt	tccggttccg	3060
gcaccgactt	caccctgacc	atctcctccg	ttcaggctga	agacctggct	gtttactact	3120
gccagaacga	ctactccaac	ccactgacct	tcgggtgggtg	caccaaactg	gaacttaagc	3180
gcgctgggtg	tggagggtct	ggaggagggtg	ggagtggggg	agggtggatcc	ggcgggggag	3240
gttcaggggg	tggcggtagt	ggaggggggc	gttcagaagt	tcaactagtt	gaatccgggtg	3300
gtgacctggt	taaaccgggt	ggttcctctga	aactgtcctg	cgctgcttcc	ggtttctcct	3360
tctcctccta	cggtatgtcc	tgggttcgtc	agaccccgga	caaacgtctg	gaatgggttg	3420
ctaccatctc	caacgggtgg	ggttacacct	actacccgga	ctccgttaaa	ggtcgtttca	3480
ccatctcccg	tgacaacgct	aaaaacaccc	tgtacctgca	gatgtcctcc	ctgaaatccg	3540
aagactcagc	tatgtactac	tgcgctcgtc	gtgaacgtta	cgacgaaaac	ggtttcgctt	3600
actgggggtca	gggtaccctg	gttaccgttt	cagcttccgg	agaattcgag	gcctcggggg	3660
ccgagggcgg	cggttctggt	tccggtgatt	ttgattatga	aaaaatggca	aacgctaata	3720
agggggctat	gaccgaaaat	gccgatgaaa	acgcgctaca	gtctgacgct	aaaggcaaac	3780
ttgattctgt	cgctactgat	tacggtgctg	ctatcgatgg	tttcattggt	gacgtttccg	3840
gccttgctaa	tggtaatggt	gctactgggtg	attttgctgg	ctctaattcc	caaattggctc	3900
aagtcgggtga	cggtgataat	tcacctttta	tgaataattt	ccgtcaatat	ttaccttccc	3960
tccctcaatc	ggttgaaatg	cgcccttttg	tctttggcgc	tggttaaacca	tatgaatttt	4020
ctattgattg	tgacaaaata	aacttatctc	gtgggtgtctt	tgcgtttctt	ttatatgttg	4080
ccacctttat	gtatgtatgt	tctacgtttg	ctaacatact	gcgtaataag	gagtcttgat	4140
aagcttcgag	aaattcacct	cgaaagcaag	ctgataaacc	gatacaatta	aaggctcctt	4200
ttggagcctt	tttttttgga	gaattcaatc	atgccagttc	ttttgggtat	tccgttatta	4260
ttgcgtttcc	tgcgtttcct	tctggtaact	ttgttcggct	atctgcttac	tttccttaaa	4320
aagggtctcg	gtaagatagc	tattgctatt	tcattgtttc	ttgctcttat	tattgggctt	4380
aactcaattc	ttgtgggtta	tctctctgat	attagcgcac	aattaccctc	tgattttggt	4440
cagggcgttc	agttaattct	cccgtcta	gcgcttccct	gtttttatgt	tattctctct	4500
gtaaaggctg	ctattttcat	ttttgacgtt	aaacaaaaaa	tcgtttctta	tttggtattg	4560
gataaataaa	tatggctggt	tattttgtaa	ctggcaaat	aggctctgga	aagacgctcg	4620
ttagcgttgg	taagattcag	gataaaattg	tagctgggtg	caaaatagca	actaatcttg	4680
atttaaggct	tcaaaacctc	ccgcaagtcg	ggagggttcg	taaaacgcct	cgcgttctta	4740
gaataccgga	taagccttct	atctctgatt	tgcttgctat	tggtcgtggt	aatgattcct	4800
acgacgaaaa	taaaaacggt	ttgcttggtc	ttgatgaatg	cggctacttg	tttaataccc	4860
gttcatggaa	tgacaaggaa	agacagccga	ttattgattg	gtttcttcat	gctcgtaaat	4920
tgggatggga	tattattttt	cttggttcagg	atttatctat	tggttgataaa	caggcgcgtt	4980
ctgcattagc	tgaacacggt	gtttattgtc	gccgtctgga	cagaattact	ttaccctttg	5040
tccgcacttt	atattctctt	gttactggct	caaaaatgcc	tctgcctaaa	ttacatgttg	5100

```

gtgttggttaa atatggtgat tctcaattaa gccctactgt tgagcgttgg ctttatactg 5160
gtaagaattt atataacgca tatgacacta aacaggcttt ttccagtaat tatgattcag 5220
gtgtttattc atatttaacc ccttatttat cacacggtcg gtatttcaaa ccattaaatt 5280
taggtcagaa gatgaaatta actaaaatat atttgaaaaa gttttctcgc gttctttgtc 5340
ttgcgatagg atttgcata gcatttacat atagttatat aacccaacct aagccggagg 5400
ttaaaaagggt agtctctcag acctatgatt ttgataaatt cactattgac tcttctcagc 5460
gtcttaaatct aagctatcgc tatgttttca aggattctaa gggaaaatta attaatagcg 5520
acgattttaca gaagcaagggt tattccatca catatattga tttatgtact gtttcaatta 5580
aaaaaggtaa ttcaaataaa attgttaaat gtaattaat ttgttttctt gatgtttgtt 5640
tcatcatctt cttttgctca agtaattgaa atgaataatt cgcctctgcg cgatttcgtg 5700
acttgggtatt caaagcaaac aggtgaatct gttattgtct cacctgatgt taaagggtaca 5760
gtgactgtat attcctctga cgttaagcct gaaaatttac gcaatttctt tatctctgtt 5820
ttacgtgcta ataattttga tatggttggc tcaattcctt ccataattca gaaatataac 5880
ccaaatagtc aggattatat tgatgaattg ccatcatctg atattcagga atatgatgat 5940
aattccgctc cttctggtgg tttctttgtt ccgcaaaatg ataatgttac tcaaacattt 6000
aaaattaata acgttcgcgc aaaggattta ataagggttg tagaattgtt tgttaaattct 6060
aatacatcta aatcctcaaa tgtattatct gttgatggtt ctaacttatt agtagttagc 6120
gccctaaag atattttaga taaccttccg caatttcttt ctactgttga tttgccaact 6180
gaccagatat tgattgaagg attaattttc gaggttcagc aagggtgatgc tttagatttt 6240
tcctttgctg ctggctctca gcgcggcact gttgctggtg gtgttaatac tgaccgtcta 6300
acctctgttt tatcttctgc ggggtggttcg ttccgtattt ttaacggcga tgttttaggg 6360
ctatcagttc gcgcattaaa gactaatagc cattcaaaaa tattgtctgt gcctcgtatt 6420
cttacgcttt caggtcagaa gggttctatt tctgttggcc agaatgtccc ttttattact 6480
ggtcgtgtaa ctggtgaatc tgccaatgta aataatccat ttcagacggt tgagcgtcaa 6540
aatgttggtt tttctatgag tgtttttccc gttgcaatgg ctggcggtaa tattgtttta 6600
gatataacca gtaaggccga tagtttgagt tcttctactc aggcaagtga tgttattact 6660
aatcaaagaa gtattgcgac aacgggttaat ttgcgtgatg gtcagactct tttgctcggg 6720
ggcctcactg attacaaaaa cacttctcaa gattctggtg tgccgttcct gtctaaaatc 6780
cctttaatcg gcctcctggt tagctcccgt tctgattcta acgaggaaag cacgttgtag 6840
gtgctcgtca aagcaaccat agtacgcgcc ctgtagcggc gcattaagcg cggcgggtgt 6900
ggtggttacg cgcagcgtga ccgctacact tgccagcgcc ctagcgcccg ctcccttcgc 6960
tttcttccct tcctttctcg ccacgttctc cggctttccc cgtcaagctc taaatcgggg 7020
gatcccttta gggttccgat ttagtgcttt acggcacctc gacctccaaa aacttgattt 7080
gggtgatggt tcacgtagtg ggccatcgcc ctgatagacg gtttttcgcc ctttgacgtt 7140
ggagtccacg ttctttaata gtggactctt gttccaaact ggaacaacac tcacaactaa 7200
ctcggcctat tcttttgatt tataaggatt tttgtcattt tctgcttact ggttaaaaaa 7260
taagctgatt taacaaatat ttaacgcgaa atttaacaaa acattaacgt ttacaattta 7320
aatatttgct tatacaatca tctgtttttt ggggcttttc tgattatcaa ccgggggtaca 7380
tatgattgac atgctagttt tacgattacc gttcatcgat tctcttggtt gctccagact 7440
ttcaggtaat gacctgatag cttttgtaga cctctcaaaa atagctaccc tctccggcat 7500
gaatttatca gctagaacgg ttgaatatca tattgacggt gatttgactg tctccggcct 7560
ttctcaccgg tttgaatctt tgccactca ttactccggc attgcattta aaatatatga 7620
gggttctaaa aatttttatc cctgcgttga aattaaggct tcaccagcaa aagtattaca 7680
gggtcataat gtttttggtt caaccgattt agctttatgc tctgaggctt tattgcttaa 7740
ttttgctaa ctctctgcct tgcttgtagc atttattggat gtt 7783

```

<210> 4

<211> 276

<212> PRT

<213> Artificial Sequence

<223> Description of Artificial Sequence: C-terminus of gene II protein encoded by phage vector fhaglA (circular)

<400> 4

Asn Ala Thr Thr Ile Ser Arg Ile Asp Ala Thr Phe Ser Ala Arg Ala
1 5 10 15

Pro Asn Glu Asn Ile Ala Lys Gln Val Ile Asp His Leu Arg Asn Val
20 25 30

Ser Asn Gly Gln Thr Lys Ser Thr Arg Ser Gln Asn Trp Glu S r Thr
35 40 45

Val Thr Trp Asn Glu Thr Ser Arg His Arg Thr Leu Val Ala Tyr Leu
 50 55 60
 Lys His Val Glu Leu Gln His Gln Ile Gln Gln Leu Ser Ser Lys Pro
 65 70 75 80
 Ser Ala Lys Met Thr Ser Tyr Gln Lys Glu Gln Leu Lys Val Leu Ser
 85 90 95
 Asn Pro Asp Leu Leu Glu Phe Ala Ser Gly Leu Val Arg Phe Glu Ala
 100 105 110
 Arg Ile Glu Thr Arg Tyr Leu Lys Ser Phe Gly Leu Pro Leu Asn Leu
 115 120 125
 Phe Asp Ala Ile Arg Phe Ala Ser Asp Tyr Asn Arg Gln Gly Lys Asp
 130 135 140
 Leu Ile Phe Asp Leu Trp Ser Phe Ser Phe Ser Glu Leu Phe Lys Ala
 145 150 155 160
 Phe Glu Gly Asp Ser Met Asn Ile Tyr Asp Asp Ser Ala Val Leu Asp
 165 170 175
 Ala Ile Gln Ser Lys His Phe Thr Ile Thr Pro Ser Gly Lys Thr Ser
 180 185 190
 Phe Ala Lys Ala Ser Arg Tyr Phe Gly Phe Tyr Arg Arg Leu Val Asn
 195 200 205
 Glu Gly Tyr Asp Ser Val Ala Leu Thr Met Pro Arg Asn Ser Phe Trp
 210 215 220
 Arg Tyr Val Ser Ala Leu Val Glu Cys Gly Ile Pro Lys Ser Gln Leu
 225 230 235 240
 Met Asn Leu Ser Thr Cys Asn Asn Val Val Pro Leu Val Arg Phe Ile
 245 250 255
 Asn Val Asp Phe Ser Ser Gln Arg Pro Asp Trp Tyr Asn Glu Pro Val
 260 265 270
 Leu Lys Ile Ala
 275

<210> 5

<211> 111

<212> PRT

<213> Artificial Sequence

<223> Description of Artificial Sequence: gene X protein
 encoded by phage vector fhaglA (circular)

<400> 5

Met Asn Ile Tyr Asp Asp Ser Ala Val Leu Asp Ala Ile Gln Ser Lys
 1 5 10 15
 His Phe Thr Ile Thr Pro Ser Gly Lys Thr Ser Phe Ala Lys Ala Ser
 20 25 30
 Arg Tyr Phe Gly Phe Tyr Arg Arg Leu Val Asn Glu Gly Tyr Asp Ser
 35 40 45

Val Ala Leu Thr Met Pro Arg Asn Ser Phe Trp Arg Tyr Val Ser Ala
 50 55 60

Leu Val Glu Cys Gly Ile Pro Lys Ser Gln Leu Met Asn Leu Ser Thr
 65 70 75 80

Cys Asn Asn Val Val Pro Leu Val Arg Phe Ile Asn Val Asp Phe Ser
 85 90 95

Ser Gln Arg Pro Asp Trp Tyr Asn Glu Pro Val Leu Lys Ile Ala
 100 105 110

<210> 6

<211> 87

<212> PRT

<213> Artificial Sequence

<223> Description of Artificial Sequence: gene V protein
 encoded by phage vector fhaglA (circular)

<400> 6

Met Ile Lys Val Glu Ile Lys Pro Ser Gln Ala Gln Phe Thr Thr Arg
 1 5 10 15

Ser Gly Val Ser Arg Gln Gly Lys Pro Tyr Ser Leu Asn Glu Gln Leu
 20 25 30

Cys Tyr Val Asp Leu Gly Asn Glu Tyr Pro Val Leu Val Lys Ile Thr
 35 40 45

Leu Asp Glu Gly Gln Pro Ala Tyr Ala Pro Gly Leu Tyr Thr Val His
 50 55 60

Leu Ser Ser Phe Lys Val Gly Gln Phe Gly Ser Leu Met Ile Asp Arg
 65 70 75 80

Leu Arg Leu Val Pro Ala Lys
 85

<210> 7

<211> 33

<212> PRT

<213> Artificial Sequence

<223> Description of Artificial Sequence: gene VII protein
 encoded by phage vector fhaglA (circular)

<400> 7

Met Glu Gln Val Ala Asp Phe Asp Thr Ile Tyr Gln Ala Met Ile Gln
 1 5 10 15

Ile Ser Val Val Leu Cys Phe Ala Leu Gly Ile Ile Ala Gly Gly Gln
 20 25 30

Arg

<210> 8

<211> 36

<212> PRT

<213> Artificial Sequence

<223> Description of Artificial Sequence: gene IX protein

encoded by phage vector fhaglA (circular)

<400> 8

Met Ser Val Leu Val Tyr Ser Phe Ala Ser Phe Val Leu Gly Trp Cys
1 5 10 15

Leu Arg Ser Gly Ile Thr Tyr Phe Thr Arg Leu Met Glu Thr Ser Ser
20 25 30

Cys Val Ser Leu
35

<210> 9

<211> 73

<212> PRT

<213> Artificial Sequence

<223> Description of Artificial Sequence: gene VIII protein
encoded by phage vector fhaglA (circular)

<400> 9

Met Arg Lys Ser Leu Val Leu Lys Ala Ser Val Ala Val Ala Thr Leu
1 5 10 15

Val Pro Met Leu Ser Phe Ala Ala Glu Gly Asp Asp Pro Ala Lys Ala
20 25 30

Ala Phe Asp Ser Leu Gln Ala Ser Ala Thr Glu Tyr Ile Gly Tyr Ala
35 40 45

Trp Ala Met Val Val Val Ile Val Gly Ala Thr Ile Gly Ile Lys Leu
50 55 60

Phe Lys Lys Phe Thr Ser Lys Ala Ser
65 70

<210> 10

<211> 219

<212> PRT

<213> Artificial Sequence

<223> Description of Artificial Sequence: cat protein
encoded by phage vector fhaglA (circular)

<400> 10

Met Glu Lys Lys Ile Thr Gly Tyr Thr Thr Val Asp Ile Ser Gln Trp
1 5 10 15

His Arg Lys Glu His Phe Glu Ala Phe Gln Ser Val Ala Gln Cys Thr
20 25 30

Tyr Asn Gln Thr Val Gln Leu Asp Ile Thr Ala Phe Leu Lys Thr Val
35 40 45

Lys Lys Asn Lys His Lys Phe Tyr Pro Ala Phe Ile His Ile Leu Ala
50 55 60

Arg Leu Met Asn Ala His Pro Glu Phe Arg Met Ala Met Lys Asp Gly
65 70 75 80

Glu Leu Val Ile Trp Asp Ser Val His Pro Cys Tyr Thr Val Phe His
85 90 95

Glu Gln Thr Glu Thr Phe Ser Ser Leu Trp Ser Glu Tyr His Asp Asp

	100		105		110
Phe Arg Gln Phe Leu His Ile Tyr Ser Gln Asp Val Ala Cys Tyr Gly	115		120		125
Glu Asn Leu Ala Tyr Phe Pro Lys Gly Phe Ile Glu Asn Met Phe Phe	130		135		140
Val Ser Ala Asn Pro Trp Val Ser Phe Thr Ser Phe Asp Leu Asn Val	145		150		155
Ala Asn Met Asp Asn Phe Phe Ala Pro Val Phe Thr Met Gly Lys Tyr	165		170		175
Tyr Thr Gln Gly Asp Lys Val Leu Met Pro Leu Ala Ile Gln Val His	180		185		190
His Ala Val Cys Asp Gly Phe His Val Gly Arg Met Leu Asn Glu Leu	195		200		205
Gln Gln Tyr Cys Asp Glu Trp Gln Gly Gly Ala	210		215		

<210> 11

<211> 456

<212> PRT

<213> Artificial Sequence

<223> Description of Artificial Sequence: ompA-FLAG-scFv (anti-HAG)-gene IIIss encoded by phage vector fhag1A (circular)

<400> 11

Met Lys Lys Thr Ala Ile Ala Ile Ala Val Ala Leu Ala Gly Phe Ala	1	5	10	15
Thr Val Ala Gln Ala Asp Tyr Lys Asp Ile Val Met Thr Gln Ser Pro	20	25	30	
Ser Ser Leu Thr Val Thr Ala Gly Glu Lys Val Thr Met Ser Cys Thr	35	40	45	
Ser Ser Gln Ser Leu Phe Asn Ser Gly Lys Gln Lys Asn Tyr Leu Thr	50	55	60	
Trp Tyr Gln Gln Lys Pro Gly Gln Pro Pro Lys Val Leu Ile Tyr Trp	65	70	75	80
Ala Ser Thr Arg Glu Ser Gly Val Pro Asp Arg Phe Thr Gly Ser Gly	85	90	95	
Ser Gly Thr Asp Phe Thr Leu Thr Ile Ser Ser Val Gln Ala Glu Asp	100	105	110	
Leu Ala Val Tyr Tyr Cys Gln Asn Asp Tyr Ser Asn Pro Leu Thr Phe	115	120	125	
Gly Gly Gly Thr Lys Leu Glu Leu Lys Arg Ala Gly Gly Gly Gly Ser	130	135	140	
Gly Gly Gly Gly Ser Gly Gly Gly Gly Ser Gly Gly Gly Gly Ser Gly	145	150	155	160
Gly Gly Gly Ser Gly Gly Gly Gly Ser Glu Val Gln Leu Val Glu Ser				

165										170					175				
Gly	Gly	Asp	Leu	Val	Lys	Pro	Gly	Gly	Ser	Leu	Lys	Leu	Ser	Cys	Ala				
			180					185					190						
Ala	Ser	Gly	Phe	Ser	Phe	Ser	Ser	Tyr	Gly	Met	Ser	Trp	Val	Arg	Gln				
		195					200					205							
Thr	Pro	Asp	Lys	Arg	Leu	Glu	Trp	Val	Ala	Thr	Ile	Ser	Asn	Gly	Gly				
	210					215					220								
Gly	Tyr	Thr	Tyr	Tyr	Pro	Asp	Ser	Val	Lys	Gly	Arg	Phe	Thr	Ile	Ser				
225					230					235					240				
Arg	Asp	Asn	Ala	Lys	Asn	Thr	Leu	Tyr	Leu	Gln	Met	Ser	Ser	Leu	Lys				
				245					250					255					
Ser	Glu	Asp	Ser	Ala	Met	Tyr	Tyr	Cys	Ala	Arg	Arg	Glu	Arg	Tyr	Asp				
			260					265						270					
Glu	Asn	Gly	Phe	Ala	Tyr	Trp	Gly	Gln	Gly	Thr	Leu	Val	Thr	Val	Ser				
	275						280					285							
Ala	Ser	Gly	Glu	Phe	Glu	Ala	Ser	Gly	Ala	Glu	Gly	Gly	Gly	Ser	Gly				
	290					295					300								
Ser	Gly	Asp	Phe	Asp	Tyr	Glu	Lys	Met	Ala	Asn	Ala	Asn	Lys	Gly	Ala				
305					310					315					320				
Met	Thr	Glu	Asn	Ala	Asp	Glu	Asn	Ala	Leu	Gln	Ser	Asp	Ala	Lys	Gly				
			325						330					335					
Lys	Leu	Asp	Ser	Val	Ala	Thr	Asp	Tyr	Gly	Ala	Ala	Ile	Asp	Gly	Phe				
			340					345						350					
Ile	Gly	Asp	Val	Ser	Gly	Leu	Ala	Asn	Gly	Asn	Gly	Ala	Thr	Gly	Asp				
	355					360						365							
Phe	Ala	Gly	Ser	Asn	Ser	Gln	Met	Ala	Gln	Val	Gly	Asp	Gly	Asp	Asn				
	370					375					380								
Ser	Pro	Leu	Met	Asn	Asn	Phe	Arg	Gln	Tyr	Leu	Pro	Ser	Leu	Pro	Gln				
385				390						395					400				
Ser	Val	Glu	Cys	Arg	Pro	Phe	Val	Phe	Gly	Ala	Gly	Lys	Pro	Tyr	Glu				
			405						410					415					
Phe	Ser	Ile	Asp	Cys	Asp	Lys	Ile	Asn	Leu	Phe	Arg	Gly	Val	Phe	Ala				
		420						425					430						
Phe	Leu	Leu	Tyr	Val	Ala	Thr	Phe	Met	Tyr	Val	Phe	Ser	Thr	Phe	Ala				
	435						440					445							
Asn	Ile	Leu	Arg	Asn	Lys	Glu	Ser												
	450					455													

<210> 12

<211> 112

<212> PRT

<213> Artificial Sequence

<223> Description of Artificial Sequence: gene VI protein
 encoded by phage vector fhaglA (circular)

<400> 12

Met Pro Val Leu Leu Gly Ile Pro Leu Leu Leu Arg Phe Leu Gly Phe
 1 5 10 15
 Leu Leu Val Thr Leu Phe Gly Tyr Leu Leu Thr Phe Leu Lys Lys Gly
 20 25 30
 Ph Gly Lys Ile Ala Ile Ala Ile Ser Leu Phe Leu Ala Leu Ile Ile
 35 40 45
 Gly Leu Asn Ser Ile Leu Val Gly Tyr Leu Ser Asp Ile Ser Ala Gln
 50 55 60
 Leu Pro Ser Asp Phe Val Gln Gly Val Gln Leu Ile Leu Pro Ser Asn
 65 70 75 80
 Ala Leu Pro Cys Phe Tyr Val Ile Leu Ser Val Lys Ala Ala Ile Phe
 85 90 95
 Ile Phe Asp Val Lys Gln Lys Ile Val Ser Tyr Leu Asp Trp Asp Lys
 100 105 110

<210> 13

<211> 348

<212> PRT

<213> Artificial Sequence

<223> Description of Artificial Sequence: gene I protein
 encoded by phage vector fhag1A (circular)

<400> 13

Met Ala Val Tyr Phe Val Thr Gly Lys Leu Gly Ser Gly Lys Thr Leu
 1 5 10 15
 Val Ser Val Gly Lys Ile Gln Asp Lys Ile Val Ala Gly Cys Lys Ile
 20 25 30
 Ala Thr Asn Leu Asp Leu Arg Leu Gln Asn Leu Pro Gln Val Gly Arg
 35 40 45
 Phe Ala Lys Thr Pro Arg Val Leu Arg Ile Pro Asp Lys Pro Ser Ile
 50 55 60
 Ser Asp Leu Leu Ala Ile Gly Arg Gly Asn Asp Ser Tyr Asp Glu Asn
 65 70 75 80
 Lys Asn Gly Leu Leu Val Leu Asp Glu Cys Gly Thr Trp Phe Asn Thr
 85 90 95
 Arg Ser Trp Asn Asp Lys Glu Arg Gln Pro Ile Ile Asp Trp Phe Leu
 100 105 110
 His Ala Arg Lys Leu Gly Trp Asp Ile Ile Phe Leu Val Gln Asp Leu
 115 120 125
 Ser Ile Val Asp Lys Gln Ala Arg Ser Ala Leu Ala Glu His Val Val
 130 135 140
 Tyr Cys Arg Arg Leu Asp Arg Ile Thr Leu Pro Phe Val Gly Thr Leu
 145 150 155 160
 Tyr Ser Leu Val Thr Gly Ser Lys Met Pro Leu Pro Lys Leu His Val

				165						170						175
Gly	Val	Val	Lys	Tyr	Gly	Asp	Ser	Gln	Leu	Ser	Pro	Thr	Val	Glu	Arg	
			180					185					190			
Trp	Leu	Tyr	Thr	Gly	Lys	Asn	Leu	Tyr	Asn	Ala	Tyr	Asp	Thr	Lys	Gln	
		195					200					205				
Ala	Phe	Ser	Ser	Asn	Tyr	Asp	Ser	Gly	Val	Tyr	Ser	Tyr	Leu	Thr	Pro	
	210					215					220					
Tyr	Leu	Ser	His	Gly	Arg	Tyr	Phe	Lys	Pro	Leu	Asn	Leu	Gly	Gln	Lys	
225					230					235					240	
Met	Lys	Leu	Thr	Lys	Ile	Tyr	Leu	Lys	Lys	Phe	Ser	Arg	Val	Leu	Cys	
				245					250					255		
Leu	Ala	Ile	Gly	Phe	Ala	Ser	Ala	Phe	Thr	Tyr	Ser	Tyr	Ile	Thr	Gln	
			260					265					270			
Pro	Lys	Pro	Glu	Val	Lys	Lys	Val	Val	Ser	Gln	Thr	Tyr	Asp	Phe	Asp	
		275					280					285				
Lys	Phe	Thr	Ile	Asp	Ser	Ser	Gln	Arg	Leu	Asn	Leu	Ser	Tyr	Arg	Tyr	
	290					295					300					
Val	Phe	Lys	Asp	Ser	Lys	Gly	Lys	Leu	Ile	Asn	Ser	Asp	Asp	Leu	Gln	
305					310					315					320	
Lys	Gln	Gly	Tyr	Ser	Ile	Thr	Tyr	Ile	Asp	Leu	Cys	Thr	Val	Ser	Ile	
				325					330					335		
Lys	Lys	Gly	Asn	Ser	Asn	Glu	Ile	Val	Lys	Cys	Asn					
			340					345								

<210> 14

<211> 426

<212> PRT

<213> Artificial Sequence

<223> Description of Artificial Sequence: gene IV protein
encoded by phage vector fhaglA (circular)

<400> 14

Met	Lys	Leu	Leu	Asn	Val	Ile	Asn	Phe	Val	Phe	Leu	Met	Phe	Val	Ser
1				5					10					15	
Ser	Ser	Ser	Phe	Ala	Gln	Val	Ile	Glu	Met	Asn	Asn	Ser	Pro	Leu	Arg
			20					25					30		
Asp	Phe	Val	Thr	Trp	Tyr	Ser	Lys	Gln	Thr	Gly	Glu	Ser	Val	Ile	Val
		35					40					45			
Ser	Pro	Asp	Val	Lys	Gly	Thr	Val	Thr	Val	Tyr	Ser	Ser	Asp	Val	Lys
	50					55					60				
Pro	Glu	Asn	Leu	Arg	Asn	Phe	Phe	Ile	Ser	Val	Leu	Arg	Ala	Asn	Asn
	65				70					75				80	
Phe	Asp	Met	Val	Gly	Ser	Ile	Pro	Ser	Ile	Ile	Gln	Lys	Tyr	Asn	Pro
			85					90						95	
Asn	Ser	Gln	Asp	Tyr	Ile	Asp	Glu	Leu	Pro	Ser	Ser	Asp	Ile	Gln	Glu

100					105					110					
Tyr	Asp	Asp	Asn	Ser	Ala	Pro	Ser	Gly	Gly	Phe	Phe	Val	Pro	Gln	Asn
	115						120					125			
Asp	Asn	Val	Thr	Gln	Thr	Phe	Lys	Ile	Asn	Asn	Val	Arg	Ala	Lys	Asp
	130					135					140				
Leu	Ile	Arg	Val	Val	Glu	Leu	Phe	Val	Lys	Ser	Asn	Thr	Ser	Lys	Ser
145					150					155					160
Ser	Asn	Val	Leu	Ser	Val	Asp	Gly	Ser	Asn	Leu	Leu	Val	Val	Ser	Ala
				165					170					175	
Pro	Lys	Asp	Ile	Leu	Asp	Asn	Leu	Pro	Gln	Phe	Leu	Ser	Thr	Val	Asp
			180					185					190		
Leu	Pro	Thr	Asp	Gln	Ile	Leu	Ile	Glu	Gly	Leu	Ile	Phe	Glu	Val	Gln
		195					200					205			
Gln	Gly	Asp	Ala	Leu	Asp	Phe	Ser	Phe	Ala	Ala	Gly	Ser	Gln	Arg	Gly
	210					215					220				
Thr	Val	Ala	Gly	Gly	Val	Asn	Thr	Asp	Arg	Leu	Thr	Ser	Val	Leu	Ser
225						230					235				240
Ser	Ala	Gly	Gly	Ser	Phe	Gly	Ile	Phe	Asn	Gly	Asp	Val	Leu	Gly	Leu
				245					250					255	
Ser	Val	Arg	Ala	Leu	Lys	Thr	Asn	Ser	His	Ser	Lys	Ile	Leu	Ser	Val
			260					265					270		
Pro	Arg	Ile	Leu	Thr	Leu	Ser	Gly	Gln	Lys	Gly	Ser	Ile	Ser	Val	Gly
		275					280					285			
Gln	Asn	Val	Pro	Phe	Ile	Thr	Gly	Arg	Val	Thr	Gly	Glu	Ser	Ala	Asn
	290						295				300				
Val	Asn	Asn	Pro	Phe	Gln	Thr	Val	Glu	Arg	Gln	Asn	Val	Gly	Ile	Ser
305						310					315				320
Met	Ser	Val	Phe	Pro	Val	Ala	Met	Ala	Gly	Gly	Asn	Ile	Val	Leu	Asp
				325					330					335	
Ile	Thr	Ser	Lys	Ala	Asp	Ser	Leu	Ser	Ser	Ser	Thr	Gln	Ala	Ser	Asp
			340					345					350		
Val	Ile	Thr	Asn	Gln	Arg	Ser	Ile	Ala	Thr	Thr	Val	Asn	Leu	Arg	Asp
		355					360					365			
Gly	Gln	Thr	Leu	Leu	Leu	Gly	Gly	Leu	Thr	Asp	Tyr	Lys	Asn	Thr	Ser
	370					375					380				
Gln	Asp	Ser	Gly	Val	Pro	Phe	Leu	Ser	Lys	Ile	Pro	Leu	Ile	Gly	Leu
385						390					395				400
Leu	Phe	Ser	Ser	Arg	Ser	Asp	Ser	Asn	Glu	Glu	Ser	Thr	Leu	Tyr	Val
				405					410					415	
Leu	Val	Lys	Ala	Thr	Ile	Val	Arg	Ala	Leu						
			420					425							

<210> 15
 <211> 134
 <212> PRT
 <213> Artificial Sequence
 <223> Description of Artificial Sequence: N-terminus of gene II
 protein encoded by phage vector fhaglA (circular)

<400> 15
 Met Ile Asp Met Leu Val Leu Arg Leu Pro Phe Ile Asp Ser Leu Val
 1 5 10 15
 Cys Ser Arg Leu Ser Gly Asn Asp Leu Ile Ala Phe Val Asp Leu Ser
 20 25 30
 Lys Ile Ala Thr Leu Ser Gly Met Asn Leu Ser Ala Arg Thr Val Glu
 35 40 45
 Tyr His Ile Asp Gly Asp Leu Thr Val Ser Gly Leu Ser His Pro Phe
 50 55 60
 Glu Ser Leu Pro Thr His Tyr Ser Gly Ile Ala Phe Lys Ile Tyr Glu
 65 70 75 80
 Gly Ser Lys Asn Phe Tyr Pro Cys Val Glu Ile Lys Ala Ser Pro Ala
 85 90 95
 Lys Val Leu Gln Gly His Asn Val Phe Gly Thr Thr Asp Leu Ala Leu
 100 105 110
 Cys Ser Glu Ala Leu Leu Leu Asn Phe Ala Asn Ser Leu Pro Cys Leu
 115 120 125
 Tyr Asp Leu Leu Asp Val
 130

<210> 16
 <211> 33
 <212> DNA
 <213> Artificial Sequence

<220>
 <223> Description of Artificial Sequence: primer gIII short(for)

<400> 16
 gcttccggag aattcaatgc tggcggcggc tct 33

<210> 17
 <211> 32
 <212> DNA
 <213> Artificial Sequence

<220>
 <223> Description of Artificial Sequence: primer gIII short(rev)

<400> 17
 ccccccaag cttatcaaga ctccttatta cg 32

<210> 18
 <211> 7055
 <212> DNA

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: phage vector fjun_1B
(circular)

<220>

<221> CDS

<222> (1)..(828)

<223> C-terminus gene II

<220>

<221> CDS

<222> (496)..(828)

<223> gene X

<220>

<221> CDS

<222> (843)..(1103)

<223> gene V

<220>

<221> CDS

<222> (1108)..(1206)

<223> gene VII

<220>

<221> CDS

<222> (1206)..(1313)

<223> gene IX

<220>

<221> CDS

<222> (1301)..(1519)

<223> gene VIII

<220>

<221> CDS

<222> (1301)..(1519)

<223> gene VIII

<220>

<221> CDS

<222> (1643)..(2302)

<223> cat resistance gene

<220>

<221> CDS

<222> (2607)..(3404)

<223> ompA-FLAG-jun-gene IIIc

<220>

<221> misc_feature

<222> (2607)..(2669)

<223> ompA signal sequence

<220>

<221> misc_feature

<222> (2670)..(2681)

<223> FLAG peptide

<220>

<221> misc_feature

<222> (2697)..(2816)

<223> jun peptide

<220>

<221> misc_feature

<222> (2832)..(3404)

<223> gene III C-terminal domain

<220>

<221> CDS

<222> (3503)..(3838)

<223> gene VI

<220>

<221> CDS

<222> (3844)..(4887)

<223> gene I

<220>

<221> CDS

<222> (4868)..(6145)

<223> gene IV

<220>

<221> CDS

<222> (6654)..(7055)

<223> N-terminus gene II

<220>

<221> -10_signal

<222> (2517)..(2521)

<220>

<221> -35_signal

<222> (2494)..(2498)

<220>

<221> misc_feature

<222> (2522)..(2556)

<223> lac operator

<220>

<221> misc_signal

<222> (6146)..(6224)

<223> packaging signal

<220>

<221> rep_origin

<222> (6264)..(6409)

<223> fd ori

<220>

<221> terminator

<222> (3446)..(3488)

<223> fd terminator

<400> 18

```

aacgctacta ccattagtag aattgatgcc acctttttcag ctcgcgcccc aaatgaaaat 60
atagctaaac aggttattga ccatttgcga aatgtatcta atggtcaaac taaatctact 120
cgttcgcaga attgggaatc aactgttaca tggaatgaaa cttccagaca ccgtacttta 180
gttgcatatt taaaacatgt tgaactacag caccagattc agcaattaag ctctaagcca 240
tccgcaaaaa tgacctctta tcaaaaggag caattaaagg tactgtctaa tcctgacctg 300
ttggaatttg cttccggtct gggttcgcttt gaggctcgaa ttgaaacgcg atatttgaag 360

```

tcttttcgggc	ttcctcttaa	tctttttgat	gcaattcgc	ttgcttctga	ctataataga	420
cagggtaaag	acctgatttt	tgattttatgg	tcattctcgt	tttctgaact	gtttaaagca	480
tttgaggggg	attcaatgaa	tattttatgac	gattccgcag	tattggacgc	tatccagtct	540
aaacatttta	caattacccc	ctctggcaaa	acttcctttg	caaaagcctc	tcgctatttt	600
ggtttctatc	gtcgtctggt	taatgagggg	tatgatagtg	ttgctcttac	catgcctcgt	660
aattcctttt	ggcgttatgt	atctgcatta	gttgagtgtg	gtattcctaa	atctcaattg	720
atgaatcttt	ccacctgtaa	taatgttggt	ccgttagttc	gttttattaa	cgtagatttt	780
tcctcccaac	gtcctgactg	gtataatgag	ccagttctta	aaatcgcata	aggtaattca	840
aatgatttaa	agttgaaatt	aaaccgtctc	aagcgcaatt	tactaccctg	tctgggtgtt	900
ctcgtcaggg	caagccttat	tcactgaatg	agcagctttg	ttacgttgat	ttgggtaatg	960
aatatccggg	gcttgtcaag	attactctcg	acgaagggtc	gccagcgtat	gcgcctgggc	1020
tgtacaccgt	gcactctgtc	tcgttcaaag	ttggtcagtt	cggttctctt	atgattgacc	1080
gtctgcgcct	cggtccgggt	aagtaacatg	gagcaggtcg	cggatttcga	cacaatttat	1140
caggcgatga	tacaaatctc	cggtgtactt	tgtttcgcgc	ttggtataat	cgctgggggt	1200
caaagatgag	tggttttagtg	tattctttcg	cctctttcgt	tttaggttgg	tgccttcgta	1260
gtggcattac	gtattttacc	cgtttaaatg	aaacttcctc	atgcgtaagt	ctttagtcct	1320
caaagcctcc	gtagccgttg	ctaccctcgt	tcgatgctg	tctttcgcgt	ctgaggggtg	1380
cgatcccgc	aaagcggcct	ttgactccct	gcaagcctca	gcgaccgaat	atatcggtta	1440
tgcgtgggcg	atggttggtg	tcattgtcgg	cgcaactatc	ggtatcaagc	tgtttaagaa	1500
attcacctcg	aaagcaagct	gataaaggag	gtttctcgat	cgagacgtn	nnngagggtc	1560
caactttcac	cataatgaaa	taagatcact	accgggcgta	ttttttgagt	tatcgagatt	1620
ttcaggagct	aaggaagcta	aatggagaa	aaaaatcact	ggatatacca	ccgttgatat	1680
atcccaatgg	catcgtaaag	aacattttga	ggcatttcag	tcagttgctc	aatgtacct	1740
taaccagacc	gttcagctgg	atattacggc	ctttttaaag	accgtaaaga	aaaataagca	1800
caagttttat	ccggccttta	ttcacattct	tgcccgcctg	atgaatgctc	atccggagtt	1860
ccgtatggca	atgaaagacg	gtgagctggt	gatatgggat	agtgttcacc	cttgttacac	1920
cgttttccat	gagcaaactg	aaacgttttc	atcgctctgg	agtgaatacc	acgacgattt	1980
ccggcagttt	ctacacatat	attcgcaaga	tgtggcgtgt	tacggtgaaa	acctggccta	2040
tttccctaaa	gggtttattg	agaatatgtt	tttcgtctca	gccaatccct	gggtgagttt	2100
caccagtttt	gatttaaacg	tagccaatat	ggacaacttc	ttcgcceccg	ttttcactat	2160
gggcaaatat	tatacgcaag	gcgacaaggt	gctgatgccg	ctggcgattc	aggttcatca	2220
tgccgtttgt	gatggcttcc	atgtcggcag	aatgcttaat	gaattacaac	agtactgcga	2280
tgagtggcag	ggcggggcgt	aattttttta	aggcagttat	tggtgccctt	aaacgcctgg	2340
tgctagcctg	aggccagttt	gctcaggctc	tcccgcgtga	ggtaataatt	gctcgaccga	2400
taaaagcggc	ttcctgacag	gaggccgttt	tgttttgcag	cccacctcaa	cgcaattaat	2460
gtgagttagc	tcactcatta	ggcaccaccg	gctttacact	ttatgcttcc	ggctcgtatg	2520
ttgtgtggaa	ttgtgagcgg	ataacaattt	cacacaggaa	acagctatga	ccatgattac	2580
gaatttctag	ataacgaggg	caaaaaatga	aaaagacagc	tatcgcgatt	gcagtggcac	2640
tggttggttt	cgctaccgta	gcgcaggccg	actacaaaga	tgctgcagcc	ggtggtcgga	2700
tcgcccggct	agaggaaaaa	gtgaaaacct	tgaaagcgca	aaactccgag	ctggcgctca	2760
cggccaacat	gctcagggaa	cagggtggcac	agcttaaaca	gaaagtcatg	aaccacgggtg	2820
gtgccgaatt	caatgctggc	ggcggctctg	gtggtgggtc	tggtggcggc	tctgaggggtg	2880
gtggctctga	gggtggcggt	tctgaggggtg	gcggctctga	gggaggcggt	tccgggtggtg	2940
gctctgggtc	cggtgatttt	gattatgaaa	agatggcaaa	cgctaataag	ggggctatga	3000
ccgaaaatgc	cgatgaaaac	gcgctacagt	ctgacgctaa	aggcaaactt	gattctgtcg	3060
ctactgatta	cggtgctgct	atcgatgggt	tcattgggtga	cgtttccggc	cttgctaatg	3120
gtaatgggtc	tactgggtgat	tttgctgggt	ctaattccca	aatggctcaa	gtcggtgacg	3180
gtgataattc	acctttaatg	aataattttc	gtcaatat	accttccctc	cctcaatcgg	3240
ttgaatgtcg	cccttttgct	tttagcgctg	gtaaaccata	tgaattttct	attgattgtg	3300
acaaaataaa	cttattccgt	ggtgtctttg	cgtttctttt	atatgttgcc	acctttatgt	3360
atgtattttc	tacgtttgct	aacatactgc	gtaataagga	gtcttgataa	gcttcgagaa	3420
attcacctcg	aaagcaagct	gataaaccga	tacaattaaa	ggctcctttt	ggagcctttt	2480
tttttggaga	attaattcaa	tcatgccagt	tcttttggtt	attccgttat	tattgcgttt	3540
cctcggtttc	cttctggtaa	ctttgttcgg	ctatctgctt	actttcctta	aaaagggtct	3600
cggtaagata	gctattgcta	tttcattggt	tcttgctctt	attattgggc	ttactcaat	3660
tcttggtggg	tatctctctg	atattagcgc	acaattaccc	tctgattttg	ttcagggcgt	3720
tcagttaatt	ctcccgtcta	atgcgcttcc	ctgtttttat	gttattctct	ctgtaaaggc	3780
tgctattttc	atttttgacg	ttaaacaaaa	aatcgtttct	tatttggtat	gggataaata	3840
aatatggctg	tttattttgt	aactggcaaa	ttaggctctg	gaaagacgct	cgtagcgtt	3900
ggtaagattc	aggataaaat	tgtagctggg	tgcaaaatag	caactaatct	tgatttaagg	3960
cttcaaaacc	tcccgcaggt	cgggaggttc	gctaaaacgc	ctcgcgttct	tagaataaccg	4020
gataagcctt	ctatttctga	tttgcttgct	attggtcgtg	gtaatgat	ctacgacgaa	4080
aataaaaacg	gtttgcttgt	tcttgatgaa	tgcggtactt	ggtttaatac	ccgttcattg	4140

```

aatgacaagg aaagacagcc gattattgat tggtttcttc atgctcgtaa attgggatgg 4200
gatattatTT ttcttggtca ggatttatct attgttgata aacaggcgcg ttctgcatta 4260
gctgaacacg ttgtttattg tgcgcgtctg gacagaatta ctttaccctt tgtcggcact 4320
ttatatcttc ttgttactgg ctcaaaaatg cctctgccta aattacatgt tgggtgttgtt 4380
aaatatgggtg attctcaatt aagccctact gttgagcggt ggctttatac tggtaagaat 4440
ttatataacg catatgacac taaacaggct ttttccagta attatgattc aggtgtttat 4500
tcatatttaa ccccttatTT atcacacggg cggtatTTca aaccattaaa tttagggtcag 4560
aagatgaaat taactaaaat atatttgaaa aagttttctc gcgttctttg tcttgcgata 4620
ggatttgcat cagcatttac atatagttat ataaccacaac ctaagccgga ggtaaaaaag 4680
gtagtctctc agacctatga ttttgataaa ttcactattg actcttctca gcgtcttaat 4740
ctaagctatc gctatgtttt caaggattct aagggaatat taattaatag cgacgattta 4800
cagaagcaag gttattccat cacatatatt gatttatgta ctgtttcaat taaaaaagg 4860
aattcaaattg aaattgttaa atgtaattaa ttttgttttc ttgatgtttg tttcatcatc 4920
ttcttttgct caagtaattg aaatgaataa ttcgcctctg cgcgatttcg tgacttggtg 4980
ttcaaagcaa acaggtgaat ctgttattgt ctcacctgat gttaaaggta cagtgactgt 5040
atattcctct gacgttaagc ctgaaaattt acgcaatttc tttatctctg ttttacgtgc 5100
taataatttt gatatggttg gctcaattcc ttccataatt cagaaatata acccaaatag 5160
tcaggattat attgatgaat tgccatcatc tgatattcag gaatatgatg ataattccgc 5220
tccttctggt ggtttctttg ttccgcaaaa tgataatgtt actcaaacat ttaaaattaa 5280
taacgttcgc gcaaaggatt taataagggt tgtagaattg tttgttaa at ctaatacatc 5340
taaactcctca aatgtattat ctgttgatgg ttctaactta ttagtagtta gcgcccctaa 5400
agatatTTta gataaccttc cgcaatttct ttctactgtt gatttgccaa ctgaccagat 5460
attgattgaa ggattaattt tcgaggttca gcaagggtgat gcttttagatt tttcctttgc 5520
tgctggctct cagcgcgcca ctgttgctgg tgggtgtaaat actgaccgtc taacctctgt 5580
tttatcttct gcgggtggtt cggttcggtat ttttaacggc gatgttttag ggctatcagt 5640
tcgcgcatTA aagactaata gccattcaaa aatattgtct gtgcctcgta ttcttacgct 5700
ttcagggtcag aagggttcta tttctgttgg ccagaatgtc ccttttatta ctggtcgtgt 5760
aactggtgaa tctgccaatg taaataatcc atttcagacg gttgagcgtc aaaatgttgg 5820
tatttctatg agtgtttttc ccgttgcaat ggctggcggt aatattgttt tagatataac 5880
cagtaaggcc gatagtttga gttcttctac tcaggcaagt gatgttatta ctaatcaaag 5940
aagtattgcg acaacgggtta atttgcggtga tgggtcagact cttttgctcg gtggcctcac 6000
tgattacaaa aacacttctc aagattctgg tgtgccgttc ctgtctaaaa tccctttaat 6060
cggcctcctg tttagctccc gttctgattc taacgaggaa agcacgttgt acgtgctcgt 6120
caaagcaacc atagtacgcg ccctgtagcg gcgcattaag cgcggcggtt gtggtggtta 6180
cgcgccagcg gaccgctaca cttgccagcg ccctagcgcc cgctcctttc gctttcttcc 6240
cttcctttct cgccacgttc tccggctttc ccgtcaagc tctaaatcgg gggatccctt 6300
tagggttccg atttagtgct ttacggcacc tcgacctcca aaaacttgat ttgggtgatg 6360
gttcacgtag tgggcatcgc ccctgataga cggtttttcg ccctttgacg ttggagtcca 6420
cgttctttta tagtggactc ttgttccaaa ctggaacaac actcacaact aactcggcct 6480
attcttttga tttataagga tttttgtcat tttctgctta ctggttaaaa aataagctga 6540
tttaacaaat atttaacgcg aaatttaaca aaacattaac gtttacaatt taaatatttg 6600
cttatacaat catcctgttt ttggggcttt tctgattatc aaccggggta catatgattg 6660
acatgctagt tttacgatta ccgttcatcg attctcttgt ttgctccaga ctttcaggta 6720
atgacctgat agcctttgta gacctctcaa aaatagctac cctctccggc atgaatttat 6780
cagctagaac ggttgaatat catattgacg gtgatttgac tgtctccggc ctttctcacc 6840
cgtttgaatc tttgcctact cattactccg gcattgcatt taaaatatat gaggggtcta 6900
aaaattttta tccctgcgtt gaaattaagg cttcaccagc aaaagtatta cagggtcata 6960
atgttttttg tacaaccgat ttagctttat gctctgagge tttattgctt aattttgcta 7020
actctctgcc ttgcttgtaC gatttattgg atgtt 7055

```

<210> 19

<211> 276

<212> PRT

<213> Artificial Sequence

<223> Description of Artificial Sequence: C-terminus of gene II protein encoded by phage vector fjun_1B (circular)

<400> 19

```

Asn Ala Thr Thr Ile Ser Arg Ile Asp Ala Thr Phe Ser Ala Arg Ala
 1             5             10             15

```

```

Pro Asn Glu Asn Ile Ala Lys Gln Val Ile Asp His Leu Arg Asn Val

```

20					25					30						
Ser	Asn	Gly	Gln	Thr	Lys	Ser	Thr	Arg	Ser	Gln	Asn	Trp	Glu	Ser	Thr	
35					40					45						
Val	Thr	Trp	Asn	Glu	Thr	Ser	Arg	His	Arg	Thr	Leu	Val	Ala	Tyr	Leu	
50					55					60						
Lys	His	Val	Glu	Leu	Gln	His	Gln	Ile	Gln	Gln	Leu	Ser	Ser	Lys	Pro	
65					70					75					80	
Ser	Ala	Lys	Met	Thr	Ser	Tyr	Gln	Lys	Glu	Gln	Leu	Lys	Val	Leu	Ser	
85					90					95						
Asn	Pro	Asp	Leu	Leu	Glu	Phe	Ala	Ser	Gly	Leu	Val	Arg	Phe	Glu	Ala	
100					105					110						
Arg	Ile	Glu	Thr	Arg	Tyr	Leu	Lys	Ser	Phe	Gly	Leu	Pro	Leu	Asn	Leu	
115					120					125						
Phe	Asp	Ala	Ile	Arg	Phe	Ala	Ser	Asp	Tyr	Asn	Arg	Gln	Gly	Lys	Asp	
130					135					140						
Leu	Ile	Phe	Asp	Leu	Trp	Ser	Phe	Ser	Phe	Ser	Glu	Leu	Phe	Lys	Ala	
145					150					155					160	
Phe	Glu	Gly	Asp	Ser	Met	Asn	Ile	Tyr	Asp	Asp	Ser	Ala	Val	Leu	Asp	
165					170					175						
Ala	Ile	Gln	Ser	Lys	His	Phe	Thr	Ile	Thr	Pro	Ser	Gly	Lys	Thr	Ser	
180					185					190						
Phe	Ala	Lys	Ala	Ser	Arg	Tyr	Phe	Gly	Phe	Tyr	Arg	Arg	Leu	Val	Asn	
195					200					205						
Glu	Gly	Tyr	Asp	Ser	Val	Ala	Leu	Thr	Met	Pro	Arg	Asn	Ser	Phe	Trp	
210					215					220						
Arg	Tyr	Val	Ser	Ala	Leu	Val	Glu	Cys	Gly	Ile	Pro	Lys	Ser	Gln	Leu	
225					230					235					240	
Met	Asn	Leu	Ser	Thr	Cys	Asn	Asn	Val	Val	Pro	Leu	Val	Arg	Phe	Ile	
245					250					255						
Asn	Val	Asp	Phe	Ser	Ser	Gln	Arg	Pro	Asp	Trp	Tyr	Asn	Glu	Pro	Val	
260					265					270						
Leu	Lys	Ile	Ala													
275																

<210> 20

<211> 111

<212> PRT

<213> Artificial Sequence

<223> Description of Artificial Sequence: gene X protein
encoded by phage vector fjun_1B (circular)

<400> 20

Met	Asn	Ile	Tyr	Asp	Asp	Ser	Ala	Val	Leu	Asp	Ala	Ile	Gln	Ser	Lys
1					5				10					15	

His Phe Thr Ile Thr Pro Ser Gly Lys Thr Ser Phe Ala Lys Ala Ser

20	25	30
Arg Tyr Phe Gly Phe Tyr Arg Arg Leu Val Asn Glu Gly Tyr Asp Ser		
35	40	45
Val Ala Leu Thr Met Pro Arg Asn Ser Phe Trp Arg Tyr Val Ser Ala		
50	55	60
Leu Val Glu Cys Gly Ile Pro Lys Ser Gln Leu Met Asn Leu Ser Thr		
65	70	75
Cys Asn Asn Val Val Pro Leu Val Arg Phe Ile Asn Val Asp Phe Ser		
	85	90
		95
Ser Gln Arg Pro Asp Trp Tyr Asn Glu Pro Val Leu Lys Ile Ala		
100	105	110

<210> 21
 <211> 87
 <212> PRT
 <213> Artificial Sequence
 <223> Description of Artificial Sequence: gene V protein
 encoded by phage vector fjun_1B (circular)

<400> 21
Met Ile Lys Val Glu Ile Lys Pro Ser Gln Ala Gln Phe Thr Thr Arg
1 5 10 15
Ser Gly Val Ser Arg Gln Gly Lys Pro Tyr Ser Leu Asn Glu Gln Leu
20 25 30
Cys Tyr Val Asp Leu Gly Asn Glu Tyr Pro Val Leu Val Lys Ile Thr
35 40 45
Leu Asp Glu Gly Gln Pro Ala Tyr Ala Pro Gly Leu Tyr Thr Val His
50 55 60
Leu Ser Ser Phe Lys Val Gly Gln Phe Gly Ser Leu Met Ile Asp Arg
65 70 75 80
Leu Arg Leu Val Pro Ala Lys
85

<210> 22
 <211> 33
 <212> PRT
 <213> Artificial Sequence
 <223> Description of Artificial Sequence: gene VII protein
 encoded by phage vector fjun_1B (circular)

<400> 22
Met Glu Gln Val Ala Asp Phe Asp Thr Ile Tyr Gln Ala Met Ile Gln
1 5 10 15
Ile Ser Val Val Leu Cys Phe Ala Leu Gly Ile Ile Ala Gly Gly Gln
20 25 30

Arg

<210> 23

<211> 36

<212> PRT

<213> Artificial Sequence

<223> Description of Artificial Sequence: gene IX protein
encoded by phage vector fjun_1B (circular)

<400> 23

Met Ser Val Leu Val Tyr Ser Phe Ala Ser Phe Val Leu Gly Trp Cys
1 5 10 15

Leu Arg Ser Gly Ile Thr Tyr Phe Thr Arg Leu Met Glu Thr Ser Ser
20 25 30

Cys Val Ser Leu
35

<210> 24

<211> 73

<212> PRT

<213> Artificial Sequence

<223> Description of Artificial Sequence: gene VIII protein
encoded by phage vector fjun_1B (circular)

<400> 24

Met Arg Lys Ser Leu Val Leu Lys Ala Ser Val Ala Val Ala Thr Leu
1 5 10 15

Val Pro Met Leu Ser Phe Ala Ala Glu Gly Asp Asp Pro Ala Lys Ala
20 25 30

Ala Phe Asp Ser Leu Gln Ala Ser Ala Thr Glu Tyr Ile Gly Tyr Ala
35 40 45

Trp Ala Met Val Val Val Ile Val Gly Ala Thr Ile Gly Ile Lys Leu
50 55 60

Phe Lys Lys Phe Thr Ser Lys Ala Ser
65 70

<210> 25

<211> 219

<212> PRT

<213> Artificial Sequence

<223> Description of Artificial Sequence: cat protein
encoded by phage vector fjun_1B (circular)

<400> 25

Met Glu Lys Lys Ile Thr Gly Tyr Thr Thr Val Asp Ile Ser Gln Trp
1 5 10 15

His Arg Lys Glu His Phe Glu Ala Phe Gln Ser Val Ala Gln Cys Thr
20 25 30

Tyr Asn Gln Thr Val Gln Leu Asp Ile Thr Ala Phe Leu Lys Thr Val
35 40 45

Lys Lys Asn Lys His Lys Phe Tyr Pro Ala Phe Ile His Ile Leu Ala
50 55 60

Arg Leu Met Asn Ala His Pro Glu Phe Arg Met Ala Met Lys Asp Gly
65 70 75 80

Glu Leu Val Ile Trp Asp Ser Val His Pro Cys Tyr Thr Val Phe His
 85 90 95
 Glu Gln Thr Glu Thr Phe Ser Ser Leu Trp Ser Glu Tyr His Asp Asp
 100 105 110
 Phe Arg Gln Phe Leu His Ile Tyr Ser Gln Asp Val Ala Cys Tyr Gly
 115 120 125
 Glu Asn Leu Ala Tyr Phe Pro Lys Gly Phe Ile Glu Asn Met Phe Phe
 130 135 140
 Val Ser Ala Asn Pro Trp Val Ser Phe Thr Ser Phe Asp Leu Asn Val
 145 150 155 160
 Ala Asn Met Asp Asn Phe Phe Ala Pro Val Phe Thr Met Gly Lys Tyr
 165 170 175
 Tyr Thr Gln Gly Asp Lys Val Leu Met Pro Leu Ala Ile Gln Val His
 180 185 190
 His Ala Val Cys Asp Gly Phe His Val Gly Arg Met Leu Asn Glu Leu
 195 200 205
 Gln Gln Tyr Cys Asp Glu Trp Gln Gly Gly Ala
 210 215

<210> 26

<211> 266

<212> PRT

<213> Artificial Sequence

<223> Description of Artificial Sequence: ompA-FLAG-jun peptide-
gene IIIc encoded by phage vector fjun_1B (circular)

<400> 26

Met Lys Lys Thr Ala Ile Ala Ile Ala Val Ala Leu Ala Gly Phe Ala
 1 5 10 15
 Thr Val Ala Gln Ala Asp Tyr Lys Asp Val Asp Ala Gly Gly Arg Ile
 20 25 30
 Ala Arg Leu Glu Glu Lys Val Lys Thr Leu Lys Ala Gln Asn Ser Glu
 35 40 45
 Leu Ala Ser Thr Ala Asn Met Leu Arg Glu Gln Val Ala Gln Leu Lys
 50 55 60
 Gln Lys Val Met Asn His Gly Gly Ala Glu Phe Asn Ala Gly Gly Gly
 65 70 75 80
 Ser Gly Gly Gly Ser Gly Gly Gly Ser Glu Gly Gly Gly Ser Glu Gly
 85 90 95
 Gly Gly Ser Glu Gly Gly Gly Ser Glu Gly Gly Gly Ser Gly Gly Gly
 100 105 110
 Ser Gly Ser Gly Asp Phe Asp Tyr Glu Lys Met Ala Asn Ala Asn Lys
 115 120 125
 Gly Ala Met Thr Glu Asn Ala Asp Glu Asn Ala Leu Gln Ser Asp Ala
 130 135 140

Lys Gly Lys Leu Asp Ser Val Ala Thr Asp Tyr Gly Ala Ala Ile Asp
145 150 155 160

Gly Phe Ile Gly Asp Val Ser Gly Leu Ala Asn Gly Asn Gly Ala Thr
165 170 175

Gly Asp Phe Ala Gly Ser Asn Ser Gln Met Ala Gln Val Gly Asp Gly
180 185 190

Asp Asn Ser Pro Leu Met Asn Asn Phe Arg Gln Tyr Leu Pro Ser Leu
195 200 205

Pro Gln Ser Val Glu Cys Arg Pro Phe Val Phe Ser Ala Gly Lys Pro
210 215 220

Tyr Glu Phe Ser Ile Asp Cys Asp Lys Ile Asn Leu Phe Arg Gly Val
225 230 235 240

Phe Ala Phe Leu Leu Tyr Val Ala Thr Phe Met Tyr Val Phe Ser Thr
245 250 255

Phe Ala Asn Ile Leu Arg Asn Lys Glu Ser
260 265

<210> 27

<211> 112

<212> PRT

<213> Artificial Sequence

<223> Description of Artificial Sequence: gene VI protein
encoded by phage vector fjun_1B (circular)

<400> 27

Met Pro Val Leu Leu Gly Ile Pro Leu Leu Leu Arg Phe Leu Gly Phe
1 5 10 15

Leu Leu Val Thr Leu Phe Gly Tyr Leu Leu Thr Phe Leu Lys Lys Gly
20 25 30

Phe Gly Lys Ile Ala Ile Ala Ile Ser Leu Phe Leu Ala Leu Ile Ile
35 40 45

Gly Leu Asn Ser Ile Leu Val Gly Tyr Leu Ser Asp Ile Ser Ala Gln
50 55 60

Leu Pro Ser Asp Phe Val Gln Gly Val Gln Leu Ile Leu Pro Ser Asn
65 70 75 80

Ala Leu Pro Cys Phe Tyr Val Ile Leu Ser Val Lys Ala Ala Ile Phe
85 90 95

Ile Phe Asp Val Lys Gln Lys Ile Val Ser Tyr Leu Asp Trp Asp Lys
100 105 110

<210> 28

<211> 348

<212> PRT

<213> Artificial Sequence

<223> Description of Artificial Sequence: gene I protein
encoded by phage vector fjun_1B (circular)

<400> 28

Met	Ala	Val	Tyr	Phe	Val	Thr	Gly	Lys	Leu	Gly	Ser	Gly	Lys	Thr	Leu	1	5	10	15
Val	Ser	Val	Gly	Lys	Ile	Gln	Asp	Lys	Ile	Val	Ala	Gly	Cys	Lys	Ile	20	25	30	
Ala	Thr	Asn	Leu	Asp	Leu	Arg	Leu	Gln	Asn	Leu	Pro	Gln	Val	Gly	Arg	35	40	45	
Phe	Ala	Lys	Thr	Pro	Arg	Val	Leu	Arg	Ile	Pro	Asp	Lys	Pro	Ser	Ile	50	55	60	
Ser	Asp	Leu	Leu	Ala	Ile	Gly	Arg	Gly	Asn	Asp	Ser	Tyr	Asp	Glu	Asn	65	70	75	80
Lys	Asn	Gly	Leu	Leu	Val	Leu	Asp	Glu	Cys	Gly	Thr	Trp	Phe	Asn	Thr	85	90	95	
Arg	Ser	Trp	Asn	Asp	Lys	Glu	Arg	Gln	Pro	Ile	Ile	Asp	Trp	Phe	Leu	100	105	110	
His	Ala	Arg	Lys	Leu	Gly	Trp	Asp	Ile	Ile	Phe	Leu	Val	Gln	Asp	Leu	115	120	125	
Ser	Ile	Val	Asp	Lys	Gln	Ala	Arg	Ser	Ala	Leu	Ala	Glu	His	Val	Val	130	135	140	
Tyr	Cys	Arg	Arg	Leu	Asp	Arg	Ile	Thr	Leu	Pro	Phe	Val	Gly	Thr	Leu	145	150	155	160
Tyr	Ser	Leu	Val	Thr	Gly	Ser	Lys	Met	Pro	Leu	Pro	Lys	Leu	His	Val	165	170	175	
Gly	Val	Val	Lys	Tyr	Gly	Asp	Ser	Gln	Leu	Ser	Pro	Thr	Val	Glu	Arg	180	185	190	
Trp	Leu	Tyr	Thr	Gly	Lys	Asn	Leu	Tyr	Asn	Ala	Tyr	Asp	Thr	Lys	Gln	195	200	205	
Ala	Phe	Ser	Ser	Asn	Tyr	Asp	Ser	Gly	Val	Tyr	Ser	Tyr	Leu	Thr	Pro	210	215	220	
Tyr	Leu	Ser	His	Gly	Arg	Tyr	Phe	Lys	Pro	Leu	Asn	Leu	Gly	Gln	Lys	225	230	235	240
Met	Lys	Leu	Thr	Lys	Ile	Tyr	Leu	Lys	Lys	Phe	Ser	Arg	Val	Leu	Cys	245	250	255	
Leu	Ala	Ile	Gly	Phe	Ala	Ser	Ala	Phe	Thr	Tyr	Ser	Tyr	Ile	Thr	Gln	260	265	270	
Pro	Lys	Pro	Glu	Val	Lys	Lys	Val	Val	Ser	Gln	Thr	Tyr	Asp	Phe	Asp	275	280	285	
Lys	Phe	Thr	Ile	Asp	Ser	Ser	Gln	Arg	Leu	Asn	Leu	Ser	Tyr	Arg	Tyr	290	295	300	
Val	Phe	Lys	Asp	Ser	Lys	Gly	Lys	Leu	Ile	Asn	Ser	Asp	Asp	Leu	Gln	305	310	315	320
Lys	Gln	Gly	Tyr	Ser	Ile	Thr	Tyr	Ile	Asp	Leu	Cys	Thr	Val	Ser	Ile	325	330	335	

Lys Lys Gly Asn Ser Asn Glu Ile Val Lys Cys Asn
 340 345

<210> 29

<211> 426

<212> PRT

<213> Artificial Sequence

<223> Description of Artificial Sequence: gene IV protein
 encoded by phage vector fjun_1B (circular)

<400> 29

Met Lys Leu Leu Asn Val Ile Asn Phe Val Phe Leu Met Phe Val Ser
 1 5 10 15

Ser Ser Ser Phe Ala Gln Val Ile Glu Met Asn Asn Ser Pro Leu Arg
 20 25 30

Asp Phe Val Thr Trp Tyr Ser Lys Gln Thr Gly Glu Ser Val Ile Val
 35 40 45

Ser Pro Asp Val Lys Gly Thr Val Thr Val Tyr Ser Ser Asp Val Lys
 50 55 60

Pro Glu Asn Leu Arg Asn Phe Phe Ile Ser Val Leu Arg Ala Asn Asn
 65 70 75 80

Phe Asp Met Val Gly Ser Ile Pro Ser Ile Ile Gln Lys Tyr Asn Pro
 85 90 95

Asn Ser Gln Asp Tyr Ile Asp Glu Leu Pro Ser Ser Asp Ile Gln Glu
 100 105 110

Tyr Asp Asp Asn Ser Ala Pro Ser Gly Gly Phe Phe Val Pro Gln Asn
 115 120 125

Asp Asn Val Thr Gln Thr Phe Lys Ile Asn Asn Val Arg Ala Lys Asp
 130 135 140

Leu Ile Arg Val Val Glu Leu Phe Val Lys Ser Asn Thr Ser Lys Ser
 145 150 155 160

Ser Asn Val Leu Ser Val Asp Gly Ser Asn Leu Leu Val Val Ser Ala
 165 170 175

Pro Lys Asp Ile Leu Asp Asn Leu Pro Gln Phe Leu Ser Thr Val Asp
 180 185 190

Leu Pro Thr Asp Gln Ile Leu Ile Glu Gly Leu Ile Phe Glu Val Gln
 195 200 205

Gln Gly Asp Ala Leu Asp Phe Ser Phe Ala Ala Gly Ser Gln Arg Gly
 210 215 220

Thr Val Ala Gly Gly Val Asn Thr Asp Arg Leu Thr Ser Val Leu Ser
 225 230 235 240

Ser Ala Gly Gly Ser Phe Gly Ile Phe Asn Gly Asp Val Leu Gly Leu
 245 250 255

Ser Val Arg Ala Leu Lys Thr Asn Ser His Ser Lys Ile Leu Ser Val
 260 265 270

Pro Arg Ile Leu Thr Leu Ser Gly Gln Lys Gly Ser Ile Ser Val Gly
 275 280 285
 Gln Asn Val Pro Phe Ile Thr Gly Arg Val Thr Gly Glu Ser Ala Asn
 290 295 300
 Val Asn Asn Pro Phe Gln Thr Val Glu Arg Gln Asn Val Gly Ile Ser
 305 310 315 320
 Met Ser Val Phe Pro Val Ala Met Ala Gly Gly Asn Ile Val Leu Asp
 325 330 335
 Ile Thr Ser Lys Ala Asp Ser Leu Ser Ser Ser Thr Gln Ala Ser Asp
 340 345 350
 Val Ile Thr Asn Gln Arg Ser Ile Ala Thr Thr Val Asn Leu Arg Asp
 355 360 365
 Gly Gln Thr Leu Leu Leu Gly Gly Leu Thr Asp Tyr Lys Asn Thr Ser
 370 375 380
 Gln Asp Ser Gly Val Pro Phe Leu Ser Lys Ile Pro Leu Ile Gly Leu
 385 390 395 400
 Leu Phe Ser Ser Arg Ser Asp Ser Asn Glu Glu Ser Thr Leu Tyr Val
 405 410 415
 Leu Val Lys Ala Thr Ile Val Arg Ala Leu
 420 425

<210> 30

<211> 134

<212> PRT

<213> Artificial Sequence

<223> Description of Artificial Sequence: N-terminus of gene II protein encoded by phage vector fjun_1B (circular)

<400> 30

Met Ile Asp Met Leu Val Leu Arg Leu Pro Phe Ile Asp Ser Leu Val
 1 5 10 15

Cys Ser Arg Leu Ser Gly Asn Asp Leu Ile Ala Phe Val Asp Leu Ser
 20 25 30

Lys Ile Ala Thr Leu Ser Gly Met Asn Leu Ser Ala Arg Thr Val Glu
 35 40 45

Tyr His Ile Asp Gly Asp Leu Thr Val Ser Gly Leu Ser His Pro Phe
 50 55 60

Glu Ser Leu Pro Thr His Tyr Ser Gly Ile Ala Phe Lys Ile Tyr Glu
 65 70 75 80

Gly Ser Lys Asn Phe Tyr Pro Cys Val Glu Ile Lys Ala Ser Pro Ala
 85 90 95

Lys Val Leu Gln Gly His Asn Val Phe Gly Thr Thr Asp Leu Ala Leu
 100 105 110

Cys Ser Glu Ala Leu Leu Leu Asn Phe Ala Asn Ser Leu Pro Cys Leu
 115 120 125

Tyr Asp Leu Leu Asp Val
130

<210> 31
<211> 6971
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: phage vector fpep3_1B-IR3seq
(circular)

<220>
<221> CDS
<222> (94)..(429)
<223> gene VI

<220>
<221> CDS
<222> (435)..(1478)
<223> gene I

<220>
<221> CDS
<222> (1459)..(2736)
<223> gene IV

<220>
<221> CDS
<222> (3245)..(4474)
<223> gene II

<220>
<221> CDS
<222> (4142)..(4474)
<223> gene X

<220>
<221> CDS
<222> (4489)..(4749)
<223> gene V

<220>
<221> CDS
<222> (4754)..(4852)
<223> gene VII

<220>
<221> CDS
<222> (4852)..(4959)
<223> gene IX

<220>
<221> CDS
<222> (4947)..(5165)
<223> gene VIII

<220>
<221> CDS
<222> (5289)..(5945)
<223> cat resistance gene

<220>
 <221> CDS
 <222> (6253)..(6969)
 <223> ompA-FLAG-pep3-gIIIs

<220>
 <221> misc_feature
 <222> (6253)..(6315)
 <223> ompA signal sequence

<220>
 <221> misc_feature
 <222> (6316)..(6327)
 <223> FLAG peptide

<220>
 <221> misc_feature
 <222> (6334)..(6372)
 <223> peptide 3

<220>
 <221> misc_feature
 <222> (6394)..(6969)
 <223> gene IIIs

<220>
 <221> -10_signal
 <222> (6140)..(6144)

<220>
 <221> -35_signal
 <222> (6163)..(6167)

<220>
 <221> misc_feature
 <222> (6168)..(6202)
 <223> lac operator

<220>
 <221> misc_signal
 <222> (2737)..(2815)
 <223> packaging signal

<220>
 <221> rep_origin
 <222> (3033)..(3149)
 <223> f1 ori

<220>
 <221> terminator
 <222> (49)..(70)
 <223> fd terminator

<400> 31
 agcttcgaga aattcacctc gaaagcaagc tgataaaccg atacaattaa aggctccttt 60
 tggagccttt ttttttggag aattaattca atcatgccag ttcttttggg tattccgtta 120
 ttattgcgtt tcctcgggtt ccttctggta actttgttcg gctatctgct tactttcctt 180
 aaaaagggct tcggtaagat agctattgct atttcattgt ttcttgctct tattattggg 240
 cttaactcaa ttcttggtgg ttatctctct gatattagcg cacaattacc ctctgatttt 300
 gtgcagggcg ttcagttaat tctcccgtct aatgcgcttc cctgttttta tgttattctc 360
 tctgtaaagg ctgctatttt catttttgac gttaaacaaa aaatcgtttc ttatttgat 420
 tgggataaat aaatatggct gtttatattg taactggcaa attaggctct ggaaagacgc 480

tcgttagcgt	tggttaagatt	caggataaaa	ttgtagctgg	gtgcaaaata	gcaactaatc	540
ttgattttaag	gcttcaaaaac	ctcccgcgaag	tcgggagggtt	cgctaaaacg	cctcgcgttc	600
ttagaataacc	ggataagcct	tctattttctg	atttgcttgc	tattgggtcgt	ggtaatgatt	660
cctacgacga	aaataaaaaac	ggtttgcttg	ttcttgatga	atgcggtact	tggtttaata	720
cccgttcatg	gaatgacaag	gaaagacagc	cgattattga	ttggtttctt	catgctcgta	780
aattgggatg	ggatattatt	tttcttggtc	aggattttatc	tattggttgat	aaacaggcgc	840
gttctgcatt	agctgaacac	gttgttttatt	gtcgcggtct	ggacagaatt	actttaccct	900
ttgtcggcac	tttatattct	cttgttactg	gctcaaaaat	gcctctgcct	aaattacatg	960
ttggtggttg	taaatatggt	gattctcaat	taagccctac	tggtgagcgt	tggctttata	1020
ctggtaagaa	tttatataac	gcatatgaca	ctaaacaggc	tttttccagt	aattatgatt	1080
cagggtgttta	ttcatattta	accccttatt	tatcacacgg	tcggtatttc	aaaccattaa	1140
atthaggtca	gaagatgaaa	ttaactaaaa	tatatttgaa	aaagttttct	cgcgttcttt	1200
gtcttgcgat	aggatttgca	tcagcattta	catatagtta	tataacccaa	cctaagccgg	1260
aggttaaaaa	ggtagtctct	cagacctatg	attttgataa	attcactatt	gactcttctc	1320
agcgtcttaa	tctaagctat	cgctatgttt	tcaaggattc	taagggaaaa	ttaattaata	1380
gcgacgattt	acagaagcaa	ggttattcca	tcacatatat	tgatttatgt	actgtttcaa	1440
ttaaaaaagg	taattcaaat	gaaattgtta	aatgtaatta	attttgtttt	cttgatgttt	1500
gtttcatcat	cttcttttgc	tcaagtaatt	gaaatgaata	attcgctctc	gcgcgatttc	1560
gtgacttggt	attcaaagca	aacagggtgaa	tctgttattg	tctcacctga	tgttaaagg	1620
acagtgactg	tatatctctc	tgacgttaag	cctgaaaatt	tacgcaattt	ctttatctct	1680
gttttacgtg	ctaataattt	tgatatgggt	ggctctaate	cttccataat	tcagaaatat	1740
aacccaaata	gtcaggatta	tattgatgaa	ttgccatcat	ctgatattca	ggaatatgat	1800
gataattccg	ctccttctgg	tggtttcttt	gttccgcaaa	atgataatgt	tactcaaaca	1860
tttaaaatta	ataacgttcg	cgcaaaggat	tttaataagg	ttgtagaatt	gtttgttaaa	1920
tctaatacat	ctaaatcctc	aaatgtatta	tctgttgatg	gttctaactt	attagtagtt	1980
agcgccccta	aagatatttt	agataacctt	ccgcaatttc	tttctactgt	tgatttgcca	2040
actgaccaga	tattgattga	aggattaatt	ttcgagggtc	agcaagggtga	tgcttttagat	2100
ttttcctttg	ctgctggctc	tcagcgcggc	actgttgctg	gtgggtgttaa	tactgaccgt	2160
ctaacctctg	ttttatcttc	tgccgggtgg	tcgttcggta	tttttaacgg	cgatgtttta	2220
gggctatcag	ttcgcgcatt	aaagactaat	agccattcaa	aaatattgtc	tgtgcctcgt	2280
attcttacgc	tttcagggtca	gaagggttct	atctctgttg	gccagaatgt	cccttttatt	2340
actggtcgtg	taactgggtga	atctgccaat	gtaaataatc	catttcagac	aattgagcgt	2400
caaaatgttg	gtatttctat	gagtgttttt	cccgttgcaa	tggtcgccgg	taatattgtt	2460
ttagatataa	ccagtaaggc	cgatagtttg	agttcttcta	ctcaggcaag	tgatgttatt	2520
actaatcaaa	gaagtattgc	gacaacgggt	aatttgcggtg	atggtcagac	tcttttgctc	2580
ggtggcctca	ctgattacaa	aaacacttct	caagattctg	gtgtgccgtt	cctgtctaaa	2640
atccctttta	tcggcctcct	gttttagctcc	cgttctgatt	ctaacgagga	aagcacgttg	2700
tacgtgctcg	tcaaagcaac	catagtacgc	gccctgtagc	ggcgcatata	gcgcggcggg	2760
tgtgggtggt	acgcgcagcg	tgaccgctac	acttgccagc	gccctagcgc	ccgctccttt	2820
cgctttcttc	ccttcctttc	tcgccacggt	ctccggcttt	ccccgtcaag	ctctaaatcg	2880
ggggatccct	ttaggggttc	gatttagtgc	tttacggcac	ctcgacctcc	aaaaacttga	2940
tttgggtgat	ggttcacgta	gtgggcccac	gccctaatag	acggtttttc	gccctttgac	3000
gttgaggatc	acgttcttta	atagtggact	cttgttccaa	actggaacaa	cactcaaccc	3060
tatctcggtc	tattcttttg	atttataagg	gattttgccc	atctcgccct	attggttaaa	3120
aatgagctg	atttaacaaa	aatttaacgc	gaattttaac	aaaatattaa	cgtttacaat	3180
ttaaatatatt	gcttatataa	tcttcctggt	tttggggcct	ttctgattat	caaccggggg	3240
acatatgatt	gacatgctag	ttttacgatt	accgttctac	gattctcttg	tttgctccag	3300
actctcaggc	aatgacctga	tagccttttt	agacctctca	aaaatagcta	ccctctccgg	3360
catgaattta	tcagctagaa	cggttgaaata	tcatattgat	ggtgatttga	ctgtctccgg	3420
cctttctcac	ccgtttgaat	ctttacctac	acattactca	ggcattgcat	ttaaaaatata	3480
tgagggttct	aaaaattttt	atccttgcggt	tgaaataaag	gcttctccc	caaaagtatt	3540
acagggtcat	aatgtttttg	gtacaaccga	tttagcttta	tgctctgagg	ctttattgct	3600
taattttgct	aattctttgc	cttgccctgta	tgattttattg	gatgttaacg	ctactactat	3660
tagtagaatt	gatgccacct	tttcagctcg	cgccccaaat	gaaaatatag	ctaaacagg	3720
tattgaccat	ttgcgaaatg	tatctaattg	tcaaactaaa	tctactcggt	cgcagaattg	3780
ggaatcaact	gttacatgga	atgaaacttc	cagacaccgt	acttttagttg	catattttaa	3840
acatgttgag	ctacagcacc	agatccagca	attaagctct	aagccatccg	caaaaatgac	3900
ctcttatcaa	aaggagcaat	taaagggtact	ctctaactct	gacctgttgg	agtttgcttc	3960
cggtctgggt	cgctttgaag	ctcgaattaa	aacgcgatat	ttgaagtctt	tcgggcttcc	4020
tcttaatctt	tttgatgcaa	tccgctttgc	ttctgactat	aatagtcagg	gtaaagacct	4080
gatttttgat	ttatgggtcat	tctcgttttc	tgaactgttt	aaagcatttg	agggggattc	4140
aatgaatatt	tatgacgatt	ccgcaggtatt	ggacgctatc	cagtctaaac	attttactat	4200
tacccctctc	ggcaaaactt	cttttgcaaa	agcctctcgc	tatttttggtt	tttatcgctc	4260

```

tctggtaaac gaggggttatg atagtgttgc tcttactatg cctcgtaatt ccttttggcg 4320
ttatgtatct gcattagtgtg aatgtggtat tcctaaatct caactgatga atctttctac 4380
ctgtaataat gttgttccgt tagttcgttt tattaacgta gatttttctt cccaacgtcc 4440
tgactgggtat aatgagccag ttcttaaaat cgcataaggt aattcacaat gattaaagtt 4500
gaaattaaac catctcaagc gcaattcact acccgttctg gtgtttctcg tcagggcaag 4560
ccttattcac tgaatgagca gctttgttac gttgatttgg gtaatgaata tccggtgctt 4620
gtcaagatta ctcttgatga aggtcagcca gcctatgcgc ctggtctgta caccgtgcat 4680
ctgtcctcgt tcaaagttgg tcagttcggg tctcttatga ttgaccgtct gcgcctcgtt 4740
ccggctaagt aacatggagc aggtcgcgga ttctgacaca atttatcagg cgatgataca 4800
aatctccgtt gtactttgtt tcgcgcttgg tataatcgct gggggtcaaa gatgagtgtt 4860
ttagtgtatt ctttcgcctc ttctcgtttta ggttggtgcc ttctgtagtg cattacgtat 4920
tttaccggtt taatggaaac ttctcatgc gtaagtcttt agtcctcaaa gcctccgtag 4980
ccgttgctac cctcgttccg atgctgtctt tcgctgctga gggtgacgat cccgcaaaag 5040
cggcctttga ctccctgcaa gcctcagcga ccgaatatat cggttatgcg tgggcgatgg 5100
ttgttgatcat tgtcggcgca actatcggta tcaagctgtt taagaaattc acctcgaaag 5160
caagctgata aaggaggttt ctcgatcgag acgttggggtg aggttccaac tttcaccata 5220
atgaaataag atcactaccg ggcgtatttt ttgagttatc gagattttca ggagctaagg 5280
aagctaaaat ggagaaaaaa atcactggat ataccaccgt tgatatatcc caatggcatc 5340
gtaaagaaca ttttgaggca tttcagtcag ttgctcaatg tacctataac cagaccgttc 5400
agctggatat tacggccttt ttaaagaccg taaagaaaaa taagcacaag ttttatccgg 5460
cctttattca cattcttgcc cgcctgatga atgctcatcc ggagttccgt atggcaatga 5520
aagacggtga gctggtgata tgggatagtg ttcacccttg ttacaccgtt ttccatgagc 5580
aaactgaaac gttttcatcg ctctggagtg aataccacga cgatttccgg cagtttctac 5640
acatatattc gcaagatgtg gcgtgttacg gtgaaaacct ggcctatttc cctaaagggt 5700
ttattgagaa tatgtttttc gtctcagcca atccctgggt gagtttcacc agttttgatt 5760
taaacgtagc caatatggac aacttcttcg ccccggtttt cactatgggc aaatattata 5820
cgcaaggcga caaggtgctg atgccgctgg cgattcaggt tcatcatgcc gtttgtgatg 5880
gcttccatgt cggcagaatg cttaatgaat tacaacagta ctgcgatgag tggcagggcg 5940
gggcgtaatt tttttaaggc agttattggt gcccttaaac gcctggtgct agcctgaggc 6000
cagtttgctc aggtctctcc cgtggaggta ataattgctc gaccgataaa agcggcttcc 6060
tgacaggagg ccgttttgtt ttgcagccca cctcaacgca attaattgta gttagctcac 6120
tcattaggca cccagggctt tacactttat gcttccggct cgtatgttgt gtggaattgt 6180
gagcggataa caatttcaca caggaaacag ctatgaccat gattacgaat ttctagataa 6240
cgagggcaaa aaatgaaaaa gacagctatc gcgattgcag tggcactggc tggtttcgct 6300
accgtagcgc aggccgacta caaagatgtc gactgtattg tttatcatgc tcattatctt 6360
gttgctaagt gtggtggtgg aggatccgaa ttcaatgctg gcggcggctc tgggtggtgg 6420
tctggtggcg gctctgaggg tgggtggtct gaggggtggcg gttctgaggg tggcggctct 6480
gagggaggcg gttccggtgg tggctctggt tccggtgatt ttgattatga aaagatggca 6540
aacgctaata agggggctat gaccgaaaat gccgatgaaa acgcgctaca gtctgacgct 6600
aaaggcaaac ttgattctgt cgctactgat tacggtgctg ctatcgatgg tttcattggt 6660
gacgtttccg gccttgctaa tggtaatggt gctactggtg attttgctgg ctctaattcc 6720
caaattggctc aagtcggtga cggtgataat tcacctttaa tgaataattt ccgtcaatat 6780
ttaccttccc tccctcaatc ggttgaatgt cgcctttttg tctttggcgc tggtaaacca 6840
tatgaatttt ctattgattg tgacaaaata aacttattcc gtggtgtctt tgcgtttctt 6900
ttatatgttg ccacctttat gtatgtattt tctacgtttg ctaacatact gcgtaataag 6960
gagtcttgat a 6971

```

<210> 32

<211> 112

<212> PRT

<213> Artificial Sequence

<223> Description of Artificial Sequence: gene VI protein
encoded by phage vector fpep3_1B-IR3seq (circular)

<400> 32

```

Met Pro Val Leu Leu Gly Ile Pro Leu Leu Leu Arg Phe Leu Gly Phe
  1             5             10             15

```

```

Leu Leu Val Thr Leu Phe Gly Tyr Leu Leu Thr Phe Leu Lys Lys Gly
      20             25             30

```

```

Phe Gly Lys Ile Ala Ile Ala Ile Ser Leu Phe Leu Ala Leu Ile Ile

```

35 40 45
 Gly Leu Asn Ser Ile Leu Val Gly Tyr Leu Ser Asp Ile Ser Ala Gln
 50 55 60
 Leu Pro Ser Asp Phe Val Gln Gly Val Gln Leu Ile Leu Pro Ser Asn
 65 70 75 80
 Ala Leu Pro Cys Phe Tyr Val Ile Leu Ser Val Lys Ala Ala Ile Phe
 85 90 95
 Ile Phe Asp Val Lys Gln Lys Ile Val Ser Tyr Leu Asp Trp Asp Lys
 100 105 110

<210> 33

<211> 348

<212> PRT

<213> Artificial Sequence

<223> Description of Artificial Sequence: gene I protein
 encoded by phage vector fpep3_1B-IR3seq (circular)

<400> 33

Met Ala Val Tyr Phe Val Thr Gly Lys Leu Gly Ser Gly Lys Thr Leu
 1 5 10 15
 Val Ser Val Gly Lys Ile Gln Asp Lys Ile Val Ala Gly Cys Lys Ile
 20 25 30
 Ala Thr Asn Leu Asp Leu Arg Leu Gln Asn Leu Pro Gln Val Gly Arg
 35 40 45
 Phe Ala Lys Thr Pro Arg Val Leu Arg Ile Pro Asp Lys Pro Ser Ile
 50 55 60
 Ser Asp Leu Leu Ala Ile Gly Arg Gly Asn Asp Ser Tyr Asp Glu Asn
 65 70 75 80
 Lys Asn Gly Leu Leu Val Leu Asp Glu Cys Gly Thr Trp Phe Asn Thr
 85 90 95
 Arg Ser Trp Asn Asp Lys Glu Arg Gln Pro Ile Ile Asp Trp Phe Leu
 100 105 110
 His Ala Arg Lys Leu Gly Trp Asp Ile Ile Phe Leu Val Gln Asp Leu
 115 120 125
 Ser Ile Val Asp Lys Gln Ala Arg Ser Ala Leu Ala Glu His Val Val
 130 135 140
 Tyr Cys Arg Arg Leu Asp Arg Ile Thr Leu Pro Phe Val Gly Thr Leu
 145 150 155 160
 Tyr Ser Leu Val Thr Gly Ser Lys Met Pro Leu Pro Lys Leu His Val
 165 170 175
 Gly Val Val Lys Tyr Gly Asp Ser Gln Leu Ser Pro Thr Val Glu Arg
 180 185 190
 Trp Leu Tyr Thr Gly Lys Asn Leu Tyr Asn Ala Tyr Asp Thr Lys Gln
 195 200 205
 Ala Phe Ser Ser Asn Tyr Asp Ser Gly Val Tyr Ser Tyr Leu Thr Pro

210	215	220
Tyr Leu Ser His Gly Arg Tyr Phe Lys Pro Leu Asn Leu Gly Gln Lys		
225	230	235 240
Met Lys Leu Thr Lys Ile Tyr Leu Lys Lys Phe Ser Arg Val Leu Cys		
	245	250 255
Leu Ala Ile Gly Phe Ala Ser Ala Phe Thr Tyr Ser Tyr Ile Thr Gln		
	260	265 270
Pro Lys Pro Glu Val Lys Lys Val Val Ser Gln Thr Tyr Asp Phe Asp		
	275	280 285
Lys Phe Thr Ile Asp Ser Ser Gln Arg Leu Asn Leu Ser Tyr Arg Tyr		
	290	295 300
Val Phe Lys Asp Ser Lys Gly Lys Leu Ile Asn Ser Asp Asp Leu Gln		
	305	310 315 320
Lys Gln Gly Tyr Ser Ile Thr Tyr Ile Asp Leu Cys Thr Val Ser Ile		
	325	330 335
Lys Lys Gly Asn Ser Asn Glu Ile Val Lys Cys Asn		
	340	345

<210> 34

<211> 426

<212> PRT

<213> Artificial Sequence

<223> Description of Artificial Sequence: gene IV protein
encoded by phage vector fpep3_1B-IR3seq (circular)

<400> 34

Met Lys Leu Leu Asn Val Ile Asn Phe Val Phe Leu Met Phe Val Ser		
1	5	10 15
Ser Ser Ser Phe Ala Gln Val Ile Glu Met Asn Asn Ser Pro Leu Arg		
	20	25 30
Asp Phe Val Thr Trp Tyr Ser Lys Gln Thr Gly Glu Ser Val Ile Val		
	35	40 45
Ser Pro Asp Val Lys Gly Thr Val Thr Val Tyr Ser Ser Asp Val Lys		
	50	55 60
Pro Glu Asn Leu Arg Asn Phe Phe Ile Ser Val Leu Arg Ala Asn Asn		
	65	70 75 80
Phe Asp Met Val Gly Ser Asn Pro Ser Ile Ile Gln Lys Tyr Asn Pro		
	85	90 95
Asn Ser Gln Asp Tyr Ile Asp Glu Leu Pro Ser Ser Asp Ile Gln Glu		
	100	105 110
Tyr Asp Asp Asn Ser Ala Pro Ser Gly Gly Phe Phe Val Pro Gln Asn		
	115	120 125
Asp Asn Val Thr Gln Thr Phe Lys Ile Asn Asn Val Arg Ala Lys Asp		
	130	135 140
Leu Ile Arg Val Val Glu Leu Phe Val Lys Ser Asn Thr Ser Lys Ser		

145		150		155		160
Ser Asn Val Leu	Ser Val Asp Gly Ser	Asn Leu Leu Val Val	Ser Ala			
	165		170		175	
Pro Lys Asp Ile	Leu Asp Asn Leu	Pro Gln Phe Leu Ser	Thr Val Asp			
	180	185	190			
Leu Pro Thr Asp	Gln Ile Leu Ile	Glu Gly Leu Ile	Phe Glu Val Gln			
	195	200	205			
Gln Gly Asp Ala	Leu Asp Phe Ser Phe	Ala Ala Gly Ser	Gln Arg Gly			
	210	215	220			
Thr Val Ala Gly	Gly Val Asn Thr Asp	Arg Leu Thr Ser	Val Leu Ser			
	225	230	235		240	
Ser Ala Gly Gly	Ser Phe Gly Ile	Phe Asn Gly Asp	Val Leu Gly Leu			
	245	250	255			
Ser Val Arg Ala	Leu Lys Thr Asn	Ser His Ser Lys	Ile Leu Ser Val			
	260	265	270			
Pro Arg Ile Leu	Thr Leu Ser Gly	Gln Lys Gly Ser	Ile Ser Val Gly			
	275	280	285			
Gln Asn Val Pro	Phe Ile Thr Gly	Arg Val Thr Gly	Glu Ser Ala Asn			
	290	295	300			
Val Asn Asn Pro	Phe Gln Thr Ile	Glu Arg Gln Asn	Val Gly Ile Ser			
	305	310	315		320	
Met Ser Val Phe	Pro Val Ala Met	Ala Gly Gly Asn	Ile Val Leu Asp			
	325	330	335			
Ile Thr Ser Lys	Ala Asp Ser Leu	Ser Ser Ser Thr	Gln Ala Ser Asp			
	340	345	350			
Val Ile Thr Asn	Gln Arg Ser Ile	Ala Thr Thr Val	Asn Leu Arg Asp			
	355	360	365			
Gly Gln Thr Leu	Leu Leu Gly Gly	Leu Thr Asp Tyr	Lys Asn Thr Ser			
	370	375	380			
Gln Asp Ser Gly	Val Pro Phe Leu	Ser Lys Ile Pro	Leu Ile Gly Leu			
	385	390	395		400	
Leu Phe Ser Ser	Arg Ser Asp Ser	Asn Glu Glu Ser	Thr Leu Tyr Val			
	405	410	415			
Leu Val Lys Ala	Thr Ile Val Arg	Ala Leu				
	420	425				

<210> 35

<211> 410

<212> PRT

<213> Artificial Sequence

<223> Description of Artificial Sequence: gene II protein
 encoded by phage vector fpep3_1B-IR3seq (circular)

<400> 35

Met Ile Asp Met Leu Val Leu Arg Leu Pro Phe Ile Asp Ser Leu Val

1	5	10	15
Cys Ser Arg Leu Ser Gly Asn Asp Leu Ile Ala Phe Leu Asp Leu Ser	20	25	30
Lys Ile Ala Thr Leu Ser Gly Met Asn Leu Ser Ala Arg Thr Val Glu	35	40	45
Tyr His Ile Asp Gly Asp Leu Thr Val Ser Gly Leu Ser His Pro Phe	50	55	60
Glu Ser Leu Pro Thr His Tyr Ser Gly Ile Ala Phe Lys Ile Tyr Glu	65	70	75
Gly Ser Lys Asn Phe Tyr Pro Cys Val Glu Ile Lys Ala Ser Pro Ala	85	90	95
Lys Val Leu Gln Gly His Asn Val Phe Gly Thr Thr Asp Leu Ala Leu	100	105	110
Cys Ser Glu Ala Leu Leu Leu Asn Phe Ala Asn Ser Leu Pro Cys Leu	115	120	125
Tyr Asp Leu Leu Asp Val Asn Ala Thr Thr Ile Ser Arg Ile Asp Ala	130	135	140
Thr Phe Ser Ala Arg Ala Pro Asn Glu Asn Ile Ala Lys Gln Val Ile	145	150	155
Asp His Leu Arg Asn Val Ser Asn Gly Gln Thr Lys Ser Thr Arg Ser	165	170	175
Gln Asn Trp Glu Ser Thr Val Thr Trp Asn Glu Thr Ser Arg His Arg	180	185	190
Thr Leu Val Ala Tyr Leu Lys His Val Glu Leu Gln His Gln Ile Gln	195	200	205
Gln Leu Ser Ser Lys Pro Ser Ala Lys Met Thr Ser Tyr Gln Lys Glu	210	215	220
Gln Leu Lys Val Leu Ser Asn Pro Asp Leu Leu Glu Phe Ala Ser Gly	225	230	235
Leu Val Arg Phe Glu Ala Arg Ile Lys Thr Arg Tyr Leu Lys Ser Phe	245	250	255
Gly Leu Pro Leu Asn Leu Phe Asp Ala Ile Arg Phe Ala Ser Asp Tyr	260	265	270
Asn Ser Gln Gly Lys Asp Leu Ile Phe Asp Leu Trp Ser Phe Ser Phe	275	280	285
Ser Glu Leu Phe Lys Ala Phe Glu Gly Asp Ser Met Asn Ile Tyr Asp	290	295	300
Asp Ser Ala Val Leu Asp Ala Ile Gln Ser Lys His Phe Thr Ile Thr	305	310	315
Pro Ser Gly Lys Thr Ser Phe Ala Lys Ala Ser Arg Tyr Phe Cys Phe	325	330	335
Tyr Arg Arg Leu Val Asn Glu Gly Tyr Asp Ser Val Ala Leu Thr Met			

```

<210> 36
<211> 111
<212> PRT
<213> Artificial Sequence
<223> Description of Artificial Sequence: gene X protein
        encoded by phage vector fpep3_1B-IR3seq (circular)

<400> 36
Met Asn Ile Tyr Asp Asp Ser Ala Val Leu Asp Ala Ile Gln Ser Lys
 1             5             10             15
His Phe Thr Ile Thr Pro Ser Gly Lys Thr Ser Phe Ala Lys Ala Ser
      20             25             30
Arg Tyr Phe Cys Phe Tyr Arg Arg Leu Val Asn Glu Gly Tyr Asp Ser
      35             40             45
Val Ala Leu Thr Met Pro Arg Asn Ser Phe Trp Arg Tyr Val Ser Ala
      50             55             60
Leu Val Glu Cys Gly Ile Pro Lys Ser Gln Leu Met Asn Leu Ser Thr
      65             70             75             80
Cys Asn Asn Val Val Pro Leu Val Arg Phe Ile Asn Val Asp Phe Ser
      85             90             95
Ser Gln Arg Pro Asp Trp Tyr Asn Glu Pro Val Leu Lys Ile Ala
      100            105            110

```

```

<210> 37
<211> 87
<212> PRT
<213> Artificial Sequence
<223> Description of Artificial Sequence: gene V protein
        encoded by phage vector fpep3_1B-IR3seq (circular)

<400> 37
Met Ile Lys Val Glu Ile Lys Pro Ser Gln Ala Gln Phe Thr Thr Arg
 1             5             10             15

Ser Gly Val Ser Arg Gln Gly Lys Pro Tyr Ser Leu Asn Glu Gln Leu
      20             25             30

Cys Tyr Val Asp Leu Gly Asn Glu Tyr Pro Val Leu Val Lys Ile Thr
      35             40             45

Leu Asp Glu Gly Gln Pro Ala Tyr Ala Pro Gly Leu Tyr Thr Val His
      50             55             60

```

Leu Ser Ser Phe Lys Val Gly Gln Phe Gly Ser Leu Met Ile Asp Arg
 65 70 75 80

Leu Arg Leu Val Pro Ala Lys
 85

<210> 38

<211> 33

<212> PRT

<213> Artificial Sequence

<223> Description of Artificial Sequence: gene VII protein
 encoded by phage vector fpep3_1B-IR3seq (circular)

<400> 38

Met Glu Gln Val Ala Asp Phe Asp Thr Ile Tyr Gln Ala Met Ile Gln
 1 5 10 15

Ile Ser Val Val Leu Cys Phe Ala Leu Gly Ile Ile Ala Gly Gly Gln
 20 25 30

Arg

<210> 39

<211> 36

<212> PRT

<213> Artificial Sequence

<223> Description of Artificial Sequence: gene IX protein
 encoded by phage vector fpep3_1B-IR3seq (circular)

<400> 39

Met Ser Val Leu Val Tyr Ser Phe Ala Ser Phe Val Leu Gly Trp Cys
 1 5 10 15

Leu Arg Ser Gly Ile Thr Tyr Phe Thr Arg Leu Met Glu Thr Ser Ser
 20 25 30

Cys Val Ser Leu
 35

<210> 40

<211> 73

<212> PRT

<213> Artificial Sequence

<223> Description of Artificial Sequence: gene VIII protein
 encoded by phage vector fpep3_1B-IR3seq (circular)

<400> 40

Met Arg Lys Ser Leu Val Leu Lys Ala Ser Val Ala Val Ala Thr Leu
 1 5 10 15

Val Pro Met Leu Ser Phe Ala Ala Glu Gly Asp Asp Pro Ala Lys Ala
 20 25 30

Ala Phe Asp Ser Leu Gln Ala Ser Ala Thr Glu Tyr Ile Gly Tyr Ala
 35 40 45

Trp Ala Met Val Val Val Ile Val Gly Ala Thr Ile Gly Ile Lys Leu
 50 55 60

Phe Lys Lys Phe Thr Ser Lys Ala Ser

65

70

<210> 41

<211> 219

<212> PRT

<213> Artificial Sequence

<223> Description of Artificial Sequence: cat protein
encoded by phage vector fpep3_1B-IR3seq (circular)

<400> 41

Met	Glu	Lys	Lys	Ile	Thr	Gly	Tyr	Thr	Thr	Val	Asp	Ile	Ser	Gln	Trp
1				5					10					15	

His	Arg	Lys	Glu	His	Phe	Glu	Ala	Phe	Gln	Ser	Val	Ala	Gln	Cys	Thr
			20					25					30		

Tyr	Asn	Gln	Thr	Val	Gln	Leu	Asp	Ile	Thr	Ala	Phe	Leu	Lys	Thr	Val
		35					40					45			

Lys	Lys	Asn	Lys	His	Lys	Phe	Tyr	Pro	Ala	Phe	Ile	His	Ile	Leu	Ala
	50					55					60				

Arg	Leu	Met	Asn	Ala	His	Pro	Glu	Phe	Arg	Met	Ala	Met	Lys	Asp	Gly
65					70					75					80

Glu	Leu	Val	Ile	Trp	Asp	Ser	Val	His	Pro	Cys	Tyr	Thr	Val	Phe	His
			85						90					95	

Glu	Gln	Thr	Glu	Thr	Phe	Ser	Ser	Leu	Trp	Ser	Glu	Tyr	His	Asp	Asp
		100						105					110		

Phe	Arg	Gln	Phe	Leu	His	Ile	Tyr	Ser	Gln	Asp	Val	Ala	Cys	Tyr	Gly
		115					120					125			

Glu	Asn	Leu	Ala	Tyr	Phe	Pro	Lys	Gly	Phe	Ile	Glu	Asn	Met	Phe	Phe
	130					135					140				

Val	Ser	Ala	Asn	Pro	Trp	Val	Ser	Phe	Thr	Ser	Phe	Asp	Leu	Asn	Val
145					150					155				160	

Ala	Asn	Met	Asp	Asn	Phe	Phe	Ala	Pro	Val	Phe	Thr	Met	Gly	Lys	Tyr
			165						170					175	

Tyr	Thr	Gln	Gly	Asp	Lys	Val	Leu	Met	Pro	Leu	Ala	Ile	Gln	Val	His
		180						185					190		

His	Ala	Val	Cys	Asp	Gly	Phe	His	Val	Gly	Arg	Met	Leu	Asn	Glu	Leu
		195					200					205			

Gln	Gln	Tyr	Cys	Asp	Glu	Trp	Gln	Gly	Gly	Ala
	210					215				

<210> 42

<211> 238

<212> PRT

<213> Artificial Sequenc

<223> Description of Artificial Sequence: ompA-FLAG-peptide3-
gene IIIs encoded by phage vector fpep3_1B-IR3seq (circular)

<400> 42

Met Lys Lys Thr Ala Ile Ala Ile Ala Val Ala Leu Ala Gly Phe Ala

1	5	10	15
Thr Val Ala Gln Ala Asp Tyr Lys Asp Val Asp Cys Ile Val Tyr His	20	25	30
Ala His Tyr Leu Val Ala Lys Cys Gly Gly Gly Gly Ser Glu Phe Asn	35	40	45
Ala Gly Gly Gly Ser Gly Gly Gly Ser Gly Gly Gly Ser Glu Gly Gly	50	55	60
Gly Ser Glu Gly Gly Gly Ser Glu Gly Gly Gly Ser Glu Gly Gly Gly	65	70	75
Ser Gly Gly Gly Ser Gly Ser Gly Asp Phe Asp Tyr Glu Lys Met Ala	85	90	95
Asn Ala Asn Lys Gly Ala Met Thr Glu Asn Ala Asp Glu Asn Ala Leu	100	105	110
Gln Ser Asp Ala Lys Gly Lys Leu Asp Ser Val Ala Thr Asp Tyr Gly	115	120	125
Ala Ala Ile Asp Gly Phe Ile Gly Asp Val Ser Gly Leu Ala Asn Gly	130	135	140
Asn Gly Ala Thr Gly Asp Phe Ala Gly Ser Asn Ser Gln Met Ala Gln	145	150	155
Val Gly Asp Gly Asp Asn Ser Pro Leu Met Asn Asn Phe Arg Gln Tyr	165	170	175
Leu Pro Ser Leu Pro Gln Ser Val Glu Cys Arg Pro Phe Val Phe Gly	180	185	190
Ala Gly Lys Pro Tyr Glu Phe Ser Ile Asp Cys Asp Lys Ile Asn Leu	195	200	205
Phe Arg Gly Val Phe Ala Phe Leu Leu Tyr Val Ala Thr Phe Met Tyr	210	215	220
Val Phe Ser Thr Phe Ala Asn Ile Leu Arg Asn Lys Glu Ser	225	230	235

<210> 43

<211> 20

<212> DNA

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: primer FR604

<400> 43

gttcacgtag tgggccatcg

20

<210> 44

<211> 25

<212> DNA

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: primer FR605

<400> 44

tgagaggtct aaaaaggcta tcagg

25

<210> 45

<211> 27

<212> DNA

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: primer FR606

<400> 45

tagccttttt agacctctca aaaatag

27

<210> 46

<211> 19

<212> DNA

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: primer FR607

<400> 46

cgggtgtacag accaggcgc

19

<210> 47

<211> 39

<212> DNA

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: DNA sequence encoding peptide pep3

<400> 47

tgtattgttt atcatgctca ttatcttggt gctaagtgt

39

<210> 48

<211> 13

<212> PRT

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: synthetic peptide pep3

<400> 48

Cys Ile Val Tyr His Ala His Tyr Leu Val Ala Lys Cys
1 5 10

<210> 49

<211> 18

<212> DNA

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: primer FR614

<400> 49

gctctagata acgagggc

18

<210> 50

<211> 26

<212> DNA

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: primer FR627

<400> 50

cgcaagctta agactcctta ttacgc

26

IMATION

Fritz Rudert et al. MORPHO/9

"Novel Method and Phage for the Identification
of Nucleic Acid Sequences Encoding Members of
a Multimeric (Poly) Peptide Complex"

Filed February 1, 2000; MS-DOS

PatentIn 2.0

Express Mail Label No.
EI 187450224 US